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Bumper Xmas issue

COMMODORE

COMPUTING INTERNATIONAL

The independent Commodore magazine

Music micro, please!
Economical keyboard connections

Interfacing —
64/VIC/PET with
BBC Micro

Hard disks:
A soft option?

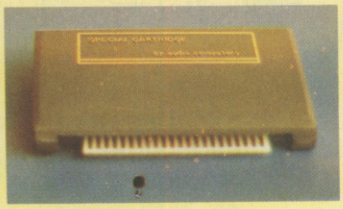
FRANCE Fr 18.5 GERMANY 6DM

70151

FROM AUDIO-COMPUTERS (SOLIDISK) THIS MONTH:

NEW LOW PRICES ON VIC-20 HARDWARE ADD-ONS AND THE INTRODUCTION OF NEW SOFTWARE CARTRIDGES

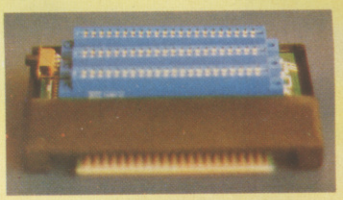
If you have already bought a memory cartridge for your VIC-20 computer, we still have many exciting items to offer, under the heading 'FURTHER EXPANSION'. They are perfectly compatible with all Commodore and many other manufacturers products.



NEW LOW PRICE ON 16K MEMORY CARTRIDGE:

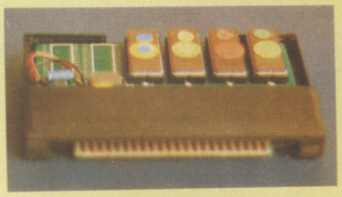
Any program sold for the VIC-20 with 8k or 16k extra memory will run with the SRC16.
The NEW PRICE of the SRC16 is now only £27.00, including VAT and manual.
It is important to know what else you can do with the SRC16 other than running big programs.
1) The SRC16 can be upgraded to 32k bytes of RAM at a fraction of the cost of a 16k cartridge. This upgrade costs only £11.00
2) The SRC16 has an X-ROM SOCKET. Games or utilities ROMs such as SCREEN ROM or SOUND ROM can be bought separately and used in this socket. Each software ROM costs around £5-10.00.
3) The SCR16 can have an EXPANSION SLOT built in. This important fact should be noted, since many VIC users experience fitting problems and extra expense when adding a Programmer's AID toolkit cartridge or the Machine Code Monitor Cartridge to their system. With many other low cost 16k memory cartridges, the user will have to buy a multi slot motherboard just to accommodate any extra cartridges. This feature alone could save you as much as £20! The SLOT is the exact reproduction of the expansion port into which the SRC16 is inserted and will cost you only £3.00. Right now you can choose any of the extra features to be built into your SRC16 cartridge. Simply tick the option boxes shown.

FURTHER EXPANSION TO THE VIC-20 COMPUTER:



1) 3 SLOT MOTHERBOARD:

for those for whom it's too late to buy a SRC16 cartridge or who want more than just memory. The 3 Slot MOTHERBOARD is not without special interest:
a) A Memory Select System allows the user to add the memory capacity of 2 RAM cartridges — for example, an SRC16 and a Commodore VIC-1111 can be used together to provide 32k bytes.
b) An optional 8k Memory System, very flexible, that will give 11775 bytes free or 6655 bytes free in the Low Res area or occasionally 8k bytes at $A000 to $BFFF for developing your own Autostart program can be added. Furthermore, if you then add your SRC16, you will get 28159 bytes free for your VIC 20!
c) 2 EPROM SOCKETS: this feature is very much appreciated by most users and has been added only very recently. You can use either 4k EPROMs (2732) or 8k EPROMs (2764) in these sockets. Each EPROM can be activated individually exactly as if you had 2 extra cartridges in your system!

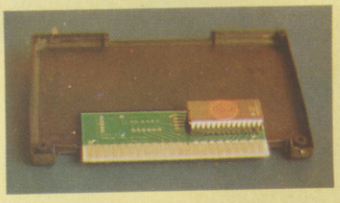


2) THE VIC EPROM PROGRAMMER: (uses 2764 Eproms)

We would need a whole page to describe this exciting peripheral for your VIC-20. Briefly, the cartridge works a little like a Disk. You can insert the VIC EPROM PROGRAMMER (VEP for short) into the SLOT and activate it with:
SYS 39000
On the VEP, you will find 4 EPROM sockets. Now type in 'C' to display the catalog. It will show what is in every EPROM. It could be like this:

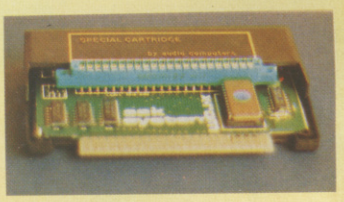
1. BIGBASIC	Simply enter 'R.1' to read the first program. You will instantly see:
2. UTILITY	*READING BIGBASIC
3. AUTOSTART GAME	*READING OK
4. BLANK EPROM	READY

Now you can list it, print it, run it etc. . .
The VEP does the loading of a 16k program in about 3 seconds with no loading error unless you have a bad RAM; it will then list out all the dead or missing bytes!
To put a program into EPROM, load it from tape or disk, activate the VEP and enter 'W PROGRAM-NAME' — very simple to do. Other useful commands provided by the VEP include Hex Memory Display, Memory Change, Memory Fill, Memory Transfer, Save a Block of Memory, Load Tape, Cold Start, Centronics Printer Drivers etc. . .
You can put Basic, utility or autostart games onto Eprom in a similar way. The VEP will work out where your program is stored and will scan the EPROMs to find enough space to put it.
You can also use it as a self contained Eprom programmer to program, verify and copy Eproms.
Utility and Autostart EPROMs made with the VEP can be used on our Motherboard or on our BLANK SOFTWARE CARTRIDGES and used as any software cartridges.
We supply a small manual together with the VEP showing how you can write an Autostart program, in Basic and in machine code. We will also supply you with a free Blank EPROM and a free Blank Software Cartridge to get you started.
A word of warning: we have developed this equipment to help users in materialising sellable software (we are very keen to buy) and will disclaim any illegal use of it.



SOFTWARE CARTRIDGES

(insert directly into back of VIC, into Motherboard or SRC slot).
1) SCREEN CARTRIDGE: Sets the screen size within limits as small or large as you like. You can for example set the screen to 40 lines × 80 columns and a 'window' of 25 lines × 30 columns, write a letter or draw a colourful playing board and move your window with control keys or joystick. As you are typing in, the window will move along to accommodate. Basic programs can be typed in, listed and run even in 80 column format. Price £10.00.
2) SOUND CARTRIDGE: transforms your VIC into an electric organ. You can play music with the keyboard, add a second voice when it plays the 1st, a 3rd when it plays back the 1st and 2nd etc, define ENVELOPE to create effects like wailing police siren, play music within basic program without slowing the speed of Basic. In short, the sound Rom makes the VIC as tuneful as the BBC micro or the ATARI. Price: £10.00
These 2 cartridges are also available in chip form. You can use the chips in the Motherboard or in the X-ROM socket of your SRC16. Price: £8.00 for either of the 2.
3) MORE CARTRIDGES will be released. We would like to market your programs in cartridge form. Alternatively, we can supply blank cartridges at very competitive prices for commercial use. We are just a phone call away so if you have a good idea, why not give us a ring?



SUMMARY	PRICE/U INCL. VAT
SRC16	£27.00
OPTIONAL EXTRAS FOR THE SRC16:*	
UPGRADE TO 32K	£11.00
EXPANSION SLOT:	£3.00
FURTHER EXPANSION:	
3 SLOT MOTHERBOARD:	£19.95
OPTIONAL EXTRA 8K FOR MOTHERBD*	£16.00
VIC EPROM PROGRAMMER (+ free gift)	£39.00
EXTRA 2764 BLANK EPROM:	£6.00
BLANK SOFTWARE CARTRIDGE:	£3.00
SOFTWARE CARTRIDGES:	
SCREEN CARTRIDGE:	£10.00
SCREEN ROM ONLY:	£8.00
SOUND EFFECT CARTRIDGE:	£10.00
SOUND EFFECT ROM only:	£8.00
Post and packing:	£1.00
TOTAL:	

*I enclose a cheque/postal order payable to SOLIDISK LTD for £:
*Please charge my Access/Barclay credit card account No:
(*Please delete/complete as applicable)

.....

Signature

Name: Mr/Mrs/Miss: .....

Address: .....

.....

.....

Please note: optional extras cannot be purchased alone. Also, if you wish to purchase them at a later date, SRCs and Motherboards must be returned together with the appropriate payment + £1 P+P. We regret we cannot accept orders of less than £10.00. All prices include VAT at 15%. Europe: deduct VAT, add £3.

Official UK dealers:
SUMLOCK, Manchester, Norman DAVIS, Mill Hill, GODFREY'S, Basildon, CURRY'S MICROSYSTEM chain store.

Official European distributors:
Benelux: ECD, Delft Tel 015 134429.
France: RUN informatique sarl, Paris Tel (01) 581 5144.
Germany: VOBIS Data computer GMBH, Aachen Tel (0241) 50 00 81.
SCHAEFER, Roetgen Tel (0240) 88 319.
Italy: SOLIDISK Italia, Inglesias (CA), Tel 0781 22529.
Portugal: LANDREY Engineering, Lisboa Tel 681243.
Sweden and Norway: DIGILOG, Goteborg Tel 031 20 29 00.

Thank you for the interest shown. Marketing Manager: H. PERRY

TO: SOLIDISK TECHNOLOGY LIMITED
(T/A AUDIO COMPUTERS)
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DEALER ENQUIRIES: 0702 618144
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COMMODORE

COMPUTING INTERNATIONAL

DECEMBER 1983

COVER STORY

An exciting project for all 64 owners. It cost us around £40 and lots of time to produce this system which makes a mini synthesiser out of the 64.

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Managing Editor ..... Nick Hampshire

Consultant Editor ..... Peter Arnott-Job

Features Editor ..... Martin Bush

Staff writer ..... Sally Wood

Technical Editor ..... Richard Franklin

Programmer ..... Carl Graham

Advertisement Manager Peter Chandler

Sales Executive ..... Susan Moisey

Telephone:

Editorial	01-636 6531
Advertising	01-636 6408
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Show expects boom crowds

At the 1984 Which Computer? Show (which is to be held at the National Exhibition Centre in Birmingham, 17-20 January) there are to be more than 100 new product launches and the show itself is to be expanded by 25%, most of this expansion being accounted for by the fact that there will be a much heavier representation of American and Japanese companies.

There will also be a new software and services centre providing supplier and product information via a Viewdata information system. An electronic directory will provide an index of 600 classifications covering the whole show and the Recognition of Information Technology Achievement awards (RITA) will be presented on the final day of the show.

A report compiled after the 1983 show indicated that 8 million was spent as a direct result of the show within the four months after the show.

NEXT ISSUE

The December issue of *Commodore Computing International* has something for everyone. There's a digitiser project – a digitiser does the reverse of a plotter. Instead of the computer telling a pen where to go, the pen tells the computer where it is.

We will also be taking the lid off one of the Commodore machines to tell you exactly what goes on inside. And for all those machine code buffs we will be publishing a very useful machine code routine which takes all those peculiar characters out of listings and explains them in (relatively) plain English!

TEMPORARY PRICE INCREASE FOR THIS SPECIAL BUMPER ISSUE ONLY BACK TO THE NORMAL PRICE NEXT MONTH

Shake out in computer market continues

The computer industry is going through a traumatic period with some smaller companies encountering serious financial problems and Texas Instruments announcement that they are pulling out of the personal computer market.

The announcement from TI followed a massive loss in excess of $300 million in that market. The biggest shock waves have been felt in those businesses supplying TI and owners of TI machines.

Investors are now being more realistic about new technology stock – TI's rating rose after their announcement! This is in marked contrast to the fall in price Commodore of shares after their announcement of a profit.

Smaller companies are also being hit. Osborne, for instance, have filed for protection under US bankruptcy laws. And Dragon have their own problems.

But the UK arm of Osborne believe they have a profitable future. Michael Healey, head of Osborne's UK distributorship, insists that there is still a market in the UK for Osborne's micro.

Commentators believe that rationalisation is taking place within the computer industry.

The distributors in the UK have approached the US authorities with a plan to buy out the British end of the company.

A lot of the concern within the industry is reflected by the number of companies that have gone public on the stock market. Following in the recent footsteps of Atlantic Computers, Telemetrix and Acorn, the British software company Logica has announced such plans.

Acorn have been placed on the Unlisted Securities Market with a price tag of about 100 million, this only a few days after they announced plans to go into the American market and to increase production of the Electron at its factory in Wales.

The effects of the shake-out in the computer manufacturing industry will have far-reaching consequences. As the market settles down it is expected that a few machines will become dominant.

Before this even happens, producers of software and hardware will be looking carefully at their own marketing strategy. It is likely that as the public becomes more selective in their buying of computers – perhaps preferring to buy a slightly more expensive machine from an established manufacturer who they know will survive – suppliers and manufacturers will also become selective.

The amount of hardware and software is therefore likely to decrease for machines whose sales are unlikely to reach a high level. Instead efforts will be concentrated on the top selling machines.

Computers at the checkout

Readers in Canada and the US will not be as puzzled as other readers by that box of lines of varying thicknesses on the front of this issue of Commodore Computing International. And UK readers who have been to a supermarket within the last 18 months or who have bought imported magazines will have seen it before.

It looks complicated but it's only a number. It's in a form which can be easily fed into a computer by way of a light pen. The lines and spaces represent numbers – just as in programming the spaces are as important as the lines because they communicate just as much information.

The number conveys all the relevant information about the product, from date of manufacture and price to size or weight and what it actually is. (Incidentally, the bar code shown here is for a packet of dehydrated mashed potato!)

Retailers in the US use the bar code much more than UK retailers. A light pen used at the checkout can feed information back to a computer which will automatically deduct each item from stock and add the price of the product to the revenue for the day.

If stocks of a product drop too low it can even automatically order extra supplies. Supporters of bar codes or article numbering foresee a day when suppliers are directly linked to retailers and no manual ordering is done at all. Others foresee a day when we won't even have to leave our homes to shop.

Commodore Computing International has introduced the bar code because sales of the magazine in North America are more important than the threats of our art director who reckons it spoils our front cover. He's big and very strong but you should see our North American sales!

Joyous joystick

"Remarkable? Yes. Impossible? Not now! Make a game out of keeping fit and suddenly it's easy as well as a pleasure. How? With the Aerobics Joystick from Suncom."

That's how the Press Release starts and we were so impressed we felt we just had to tell everyone about it. With an adaptor the Aerobics Joystick is compatible with the VIC-20 and the CBM-64.

This is what you do: The joystick connects to your keep fit cycle. The faster you pedal, the faster the game goes. As you cycle along (not quite 'along', perhaps because you stay in one place) you can also play a number of games.

There must be other similar applications. The Dentist Joystick, for instance. Play the game while the dentist drills – the greater the pain the faster the game. And for real games addicts the 'Love Joystick' – the faster you go ...!

As the final paragraph from the Press Release says: "the Aerobics Joystick takes away the boredom from biking, the guilt from idle gaming, and puts the fun into fitness." (PS It costs £34.95).

User group

The '38911 Bytes Free User Group' is a new group that has just been announced by the founder, Paul Montague.

The group, which is exclusively for existing users and prospective users of the Commodore 64, operates in the South West of England. For membership details **contact** Paul Montague, 12 Laxton Close, Taunton, Somerset TA1 2UL.

Commodore aim for world domination

Commodore looks set to become the world's leading manufacturer of home computers if pre-Christmas and New Year sales hold up.

This is good news for all Commodore owners because it means that there will continue to be a plentiful supply of compatible hardware and software.

US research company Future Computing predict revenues of $500 million in 1983 for Commodore. And in the UK both the VIC-20 and the CBM-64 have been selling well in the run up to Christmas.

But the computer market is still highly volatile and nobody is willing to predict what the position will be in the Spring of 1984. Commodore have been very aggressive in their pricing policy during 1983 which has upset some retailers, particularly in North America. They are concerned that reduced prices means reduced margins.

There are rumours that Commodore will continue to pursue an aggressive pricing policy and that this may mean further price changes. They have been fuelled by suggestions that a new range of Commodore machines may be on the way (Commodore Computing International, Vol 2 No 7).

But although the VIC is old in computer terms the 64 seems to have plenty of life left. Orders from retailers for both machines for the Christmas period have been substantial though sales of the VIC have stabilised in the US.

At Commodore's UK plant in Slough extra staff have been employed to ensure the despatch of 10,000 VIC's a day to retailers. The price of the VIC, between £130 and £140 for the complete starter pack including cassette unit and software, makes it an attractive gift buy.

By the beginning of the third quarter of 1983 the VIC had sold 2,000,000 worldwide with UK sales of 270,000 – more than enough to generate a plentiful supply of hardware and software.

The VIC has performed well for Commodore and there is every indication that the 64 is doing just as well.

IBM's Peanut creates dilemma

IBM recently announced the launch of two new personal business computers and left most of the computing world in a real dilemma. Almost everybody was expecting IBM to unveil the long awaited and much heralded Peanut personal home computer. Everybody is still waiting.

In their announcement, IBM claim that the 3270 Personal Computer – which forms part of IBM's popular computer terminal family – can display up to seven different documents and communicate with IBM mainframes at a price which greatly undercuts all of its competitors.

The release of IBM's business computers puts increased pressure on several personal business computer manufacturers. In the States, several companies are looking to their laurels.

Tandy, Apple and Digital Equipment have all seen a drop in sales and share prices over the last few months. This in a market which is currently growing at an estimated rate of 50% per year.

IBM are expecting to take 30% of the business computer market and an indication of their success in being able to achieve this target is coming from the banks.

Most major banks are allowing corporate customers the chance to talk directly to their computers by using the IBM Personal Computer as office terminals.

Galactic contest

Think of a number between 1 and 10,000. That's all you need to do to stand a chance of winning one of 20 CBM-64's or one of 100 joysticks that Galactic Software are offering in a Christmas competition.

Entry to the competition is open to anyone buying one of their products before Christmas Day. There's an entry forms with which the bottom right corner of the cassette cover from a newly purchased Galactic game must be included.

Those who already own a 64 need not feel left out. Galactic will be offering alternative prizes of disk drives or printers to existing 64 owners who win.

Each entrant chooses a number between 1 and 10,000. Galactic's own computer (a 64?) will have already chosen 120 numbers within these parameters and the closest guesses win a prize.

HMV range wide

His Master's Voice, famous until now for selling records and, more recently, video software, are moving into the computer software market.

The large store in London's Oxford Street, well known to Londoners and visitors to the UK, has recently introduced a range of software.

Their selection reflects a cautious attitude. They have chosen 70 or 80 games for a number of machines including the VIC-20. The aim of HMV is to carry the widest range of home entertainment products to be found anywhere in the UK.

Forth right language

C64-Forth from Performance Micro Products is a complete high level language and operating system designed to run on the Commodore 64. Forth programs can be written and debugged at least three times faster than Basic programs and will often run four to 10 times faster. C64-Forth also offers an integral macro assembler which allows free intermixing of Forth and assembly code.

ASCII error messages eliminate looking up an error code and the free format screen editor simplifies entering the source code. Forth screens are saved as data files allowing the intermixing of Forth object code and source screens on the same disk or tape and access to Basic data files.

C64-Forth works with any Commodore tape drive, VIC 1540 or 1541 disk drive.

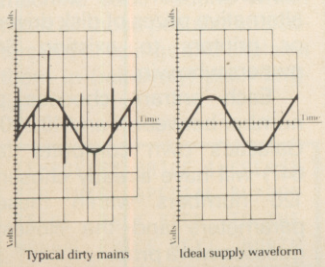
A high level extension to C64-Forth is C-64 Xtend which will not work on its own. This package provides floating points, logical functions, transcendental functions and string capabilities. The floating point ranges from 1E plus 38 to 2E-39.

Future products expected soon are C64-Graphix and C64-Debug.

Contact: Performance Micro Products, 770 Dedham Street – S2, Canton, Massachusetts, USA. Telephone: USA 617 828 1209

Suppressing nasty surges

The Power Cleaner plug cuts out power surges and spikes.



B & R Electrical Products Limited have designed a plug that should eliminate energy spikes and surges on the mains. Such occurences are quite frequent and potentially dangerous to computers and wordprocessors.

The product is called the PowerCleaner surge suppressor plug. This plug merely replaces the existing 13Amp mains plug. It is claimed that the PowerCleaner provides a reduction of up to 99% in equipment damage or disruption.

This special plug is built around sophisticated surge protection circuitry and surges are eliminated without interrupting the power supply to the equipment, cost is £8.65 pence plus VAT.

Contact: B & R Electrical Products Limited, Temple Fields, Harrow, Essex CM20 2BG. Telephone: 0279 34561

New soft sell

Better known for their involvement in bookshops and distribution of paperbacks, Websters Group PLC is moving into the computer software area. The new division of the group is called Websters Software Limited and it is planned to build a base of 500 retail accounts on a nationwide basis.

Websters will be acting as wholesalers and distributors of software and, initially, the range of software (a total of nearly 400 titles) will be aimed at the personal home computer market including the VIC and 64. Most of the software will be games, although there will also be some business and educational products.

Clive Digby-Jones of Websters Software Limited says that the company will be selling into retailers "who won't by any means be just computer shops. Instead of having to deal with dozens of different suppliers, the retailer will be able to obtain all the worthwhile titles for some 15 different types of computer from Websters Software."

Sunshine's Grace

There is a new book that will be of interest to users of the Commodore 64. It comes from Sunshine Publications, is written by Mike Grace and is called *Commodore 64 Adventures* (£5.95). This is a guide to writing and playing adventures with the emphasis being placed on the creation, design and planning of the games as well as the programming techniques.

The book is divided into two sections. First of all there is a simplified adventure framework that, claim the publishers, will work for any story and help you to understand how to create your own.

The second part will appeal to the person who buys the book just to play the game because it contains a complete adventure called Nightmare Planet. This game is complemented by the notes and anecdotes on the problems and pitfalls of adventure programming.

Laser Strike

for the commodore 64

**challenge the asteroid field,
maneuver the caves of ice,
experience the thrill,
play laser strike.**

Laser strike, written in full machine language for the Commodore 64.

**Commodore 64 is a registered trademark
of Commodore Business Machines Inc.**

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*** Ask about Laser strike posters**

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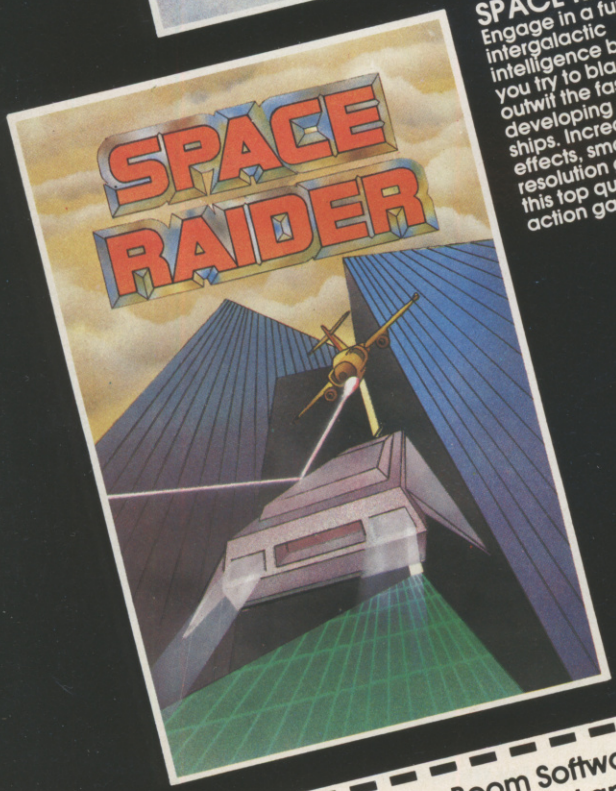
is included**

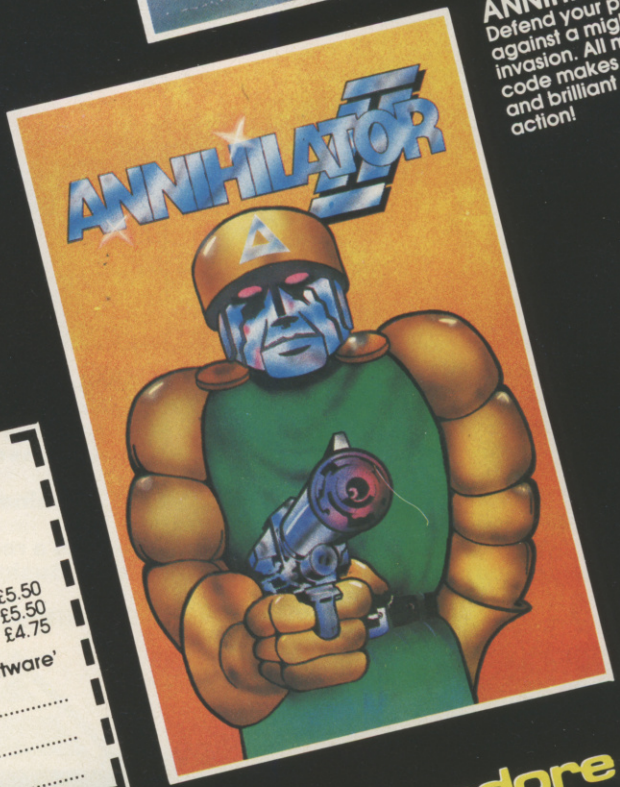
Boom Software
It will blow your mind

SKI RUN
All the excitement and skill of the ski slopes with downhill, slalom and giant slalom. Put yourself to the test and record the fastest time! Nine levels of difficulty. High quality graphics and brilliant sound effects!!

LOGGER MANIA
Can you dodge the traffic, jump your logs, slip the bears, and get home before sunset? A game with a difference written in all machine code with high quality graphics.



SPACE RAIDER
Engage in a furious intergalactic intelligence battle. As you try to blast and outwit the fast developing alien star ships. Incredible sound effects, smooth high resolution graphics in this top quality arcade action game.



ANNIHILATOR II
Defend your planet against a mighty allien invasion. All machine code makes for fast and brilliant arcade action!

Post this coupon now to Boom Software
2-4 Chichester Rents, Chancery Lane,
London WC2A 1EG

Please send me the following:

Ski Run	£5.50	Annihilator II	£5.50
Logger Mania	£5.50	Space Raider	£4.75
Annihilator II (VIC 20)	£4.75	Trek (VIC 20)	

Total cheque/PO enclosed £ ..... payable to 'Boom Software'

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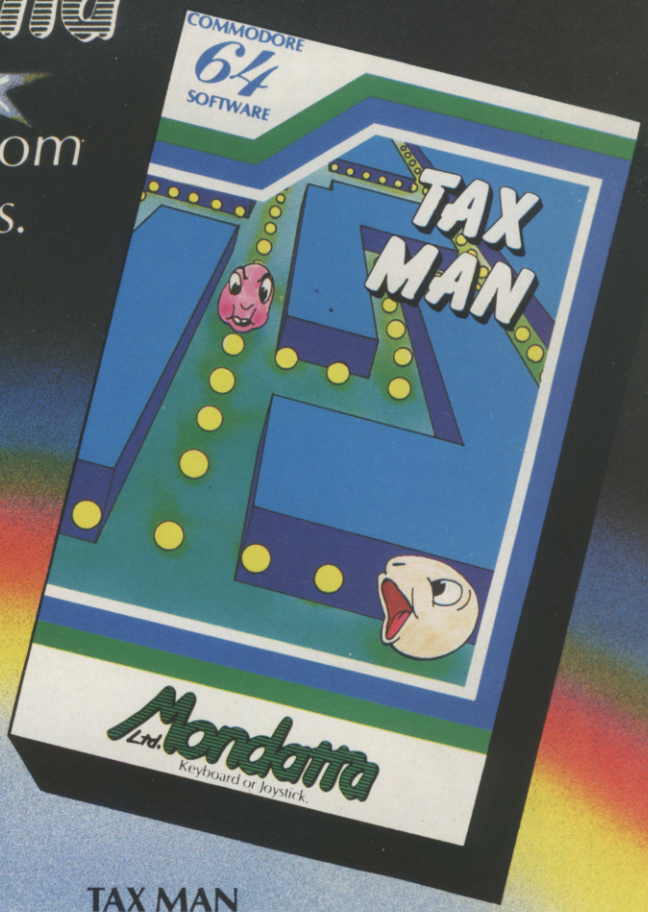
commodore 64 and VIC 20

Commodore 64

Ltd. Mondatta

Software from the States.



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Mondatta Ltd., Darwen House, 200 Rathfarnham Road, Dublin 14, Ireland. Tel: 01-963250.
Mondatta Ltd., 888 Seventh Avenue, New York, N.Y. 10106, U.S.A.

FREE ENTRY TO A **DRAW** FOR C.B.M. 64 DISK DRIVE & PRINTER.

The Lightening Oric Assembler. £9.90*

There are other assembler/editors available for the ORIC but none combine the same features and ease of use that we have obtained with this comprehensive utility program for the ORIC 48K. The manual which accompanies the assembler gives a brief insight into machine code and the use of assemblers to enable anyone to write in assembly language after just a little study. Full specifications of the assembler cannot be fitted into the small space available here and so they may be obtained from your local dealer or direct from Mr. Micro.

*Includes comprehensive instructions booklet.

Crazy Golf £6.90

48K Spectrum

Crazy golf is a new program for the 48K Spectrum you are required to clear the course avoiding and circumventing the many strange obstacles finally putting your ball in the hole. The par for each hole is displayed and a novel direction indicator combined with a force indicator enable you to send the golf ball in the direction you feel is the best one to clear the course. Crazy golf really is crazy but most of all it is fun and will be found to be very enjoyable by all members of the family.

For use with Joystick and keyboard.

Bengo £6.90

Vic 20

An exciting program for the unexpanded Vic 20, which combines fast moving strategy and reflex skills. You must control Bengo the super Eskimo against the dreadful snow Yeti – Half blind and half witted the Yeti can smell a good Eskimo lunch – the only protection Bengo has is to hurl huge blocks of ice across the frozen waste at the Yeti.

– Don't get distracted – or you'll be personally responsible for the demise of an Eskimo!

For use with Joystick.

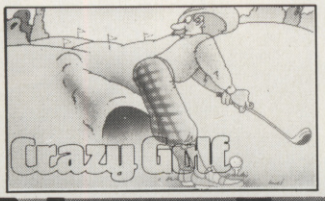
Dracula £6.90

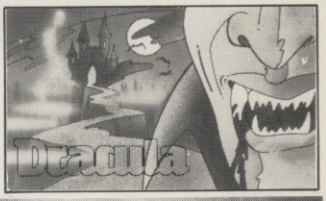
48K ORIC

A superb adventure for the 48K ORIC. This adventure is written in the good old style! No silly graphics, no gratuitous drawings, no distractions from pure mental images of horrendous realism. This evocative text adventure of the old genre will have Oric owners shivering with anticipation and perhaps fear.

Dare you load DRACULA into your ORIC 48 ?!!

By keyboard.

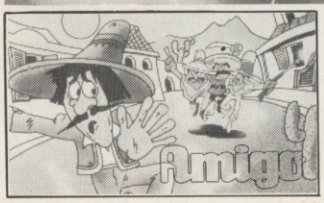




No shocks – Plenty of surprises!

Mr. Micro means programs you can trust. Programs that are as exciting when you load them as they look at your dealer. Programs that come proven and refined. Programs that bring you the breathtaking excitement of arcade games with the special extra dimension of real mental challenges – all at the right price. Plus accessories and utilities which extend the value of your computer. Ask for Mr. Micro by name at your local dealer. Or order your games direct, post-free, from: Mr. Micro Ltd. 69 Partington Lane, Swinton, Manchester M27 3AL. Cheques should be made payable to Mr. Micro Limited. Ring our 24 hour hot-line for payment by Access or Visa on: 061-728 2282.

Mr. MICRO

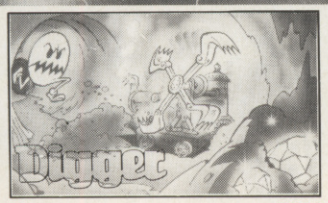


Amigo £6.90

Vic 20 8K or 16K expansion.

Hey Amigo you gotta run fast ah. The banditos they are a chasing you and they will a geta you ifa you do nota escapa OK. You musta runa rounda the blocka, when you run round de corners ofa de city the banditos they are frightened to go there and you score de points. Pity you have nota gota gun but a joystick can be fun.

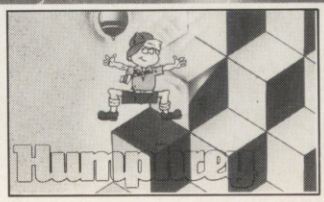
For use with Joystick.



Digger £6.90

Vic 20 8K or 16K expansion

Your remote viewer shows the path of the professors devilish digging apparatus. Using your computer linked remote control you must guide the digger beneath the earth to collect the rare micronite gems. Unfortunately the micronite is protected by the micronits who will plague your machine in order to attempt to stop its progress. You may be able to kill the micronits by skillfully manoeuvering your digger beneath a subterranean stalactite which will then fall killing any micronit in its path. This is a novel implementation of a popular arcade game. For use with Joystick.



Humphrey £6.90

Vic 20 BBC Model B

This new game for the BBC Model B or for the VIC 20 (8K or 16K expansion) and also for C.B.M. 64 involves some tricky decision taking.

Object of game is to make Humphrey land on all the cubes thus changing their colour. Unfortunately Humphrey is being chased by a bouncing ATOMIC BOMB! You will soon learn that this deceptively simple game has tremendous addictive properties and quite a high degree of tactical skill.

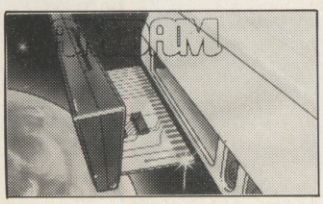
For use with keyboard or Joystick.

Mysterious Island £9.90

Vic 20 16K

Escape from prison in a hot air balloon – try to land it on Mysterious Island, then the fun really begins. ● Booby Trapped Fields ● Killer Bees ● Hostile Natives ● Hidden Clues ● Force Fields ● Capture the Nautilus ● Full Graphic Display ● Several Games lead to Exciting Climax ● Separate Practice Program ● Includes Blank Data Tape to store the game to play later.

All successful adventures can claim a unique personalised award by sending Mr. Micro their final position at the end of the game – By Joystick or keyboard.



RAMDAM £13.90

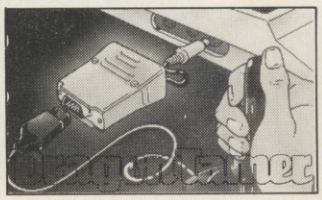
Vic 20

This accessory enables programs which would normally only work with 3K expansion to work with 8K or 16K expansion. RAMDAM saves having to buy a 3K pack if you already own an 8K or 16K. With RAMDAM and a Commodore 16K expansion all known tape games will run on your Vic 20. ● Includes Memory Test Program ● Free 6·5K game – MICROVADERS for use with Joysticks.

Punchy £6.90

Spectrum 48K

Punch has taken Judy for his evil purposes and locked her away. Judy has called upon the forces of goodness to escape, so with the help of our hero Bobby the policeman and you the purchaser of this fine program you must guide brave Bobby across the stage to rescue poor Judy. Leap the gaps. Jump over the dogs. Leap the alligator pit. Dodge the tomatoes. Rock the crib. Collect the sausages and finally rescue Judy. By Kempstone joystick or keyboard.



Dragon Tamer £9.90

Dragon 32

Allows Atari type and other digital joysticks to be used with the Dragon – giving better response and more control. For the first time your Dragon will be able to reflect your true skills. ● Achieve higher games scores ● Less Frustration.

Plus To ensure maximum value, Dragon Tamer includes two original games for use with digital Joysticks.

Goldrush £6.90

Vic 20 3·5k

This graphic adventure program was the first in the world to offer real gold for the successful adventurer. An idea which has been much copied but never equalled. ● Fun ● Educational ● Challenging ● Clues ● Puzzles ● Searches ● Fast Reaction Game. For use with keyboard.

PRODUCT NEWS

Another Scouse house

Acme Software is a new Liverpool software house whose aim is to provide good original games or better implementations of the standard 'classics.'

Their attack on the software market has already started with the launch of three games, one of which is for the VIC 20. This game is called 'Bridgeman' and the idea behind this is to plug the gaps in the bridges as the construction firm boss carries out his progressive inspections.

Acme are also planning for the future with three more games expected to be announced shortly for the Commodore 64 and VIC. 'Melga-Vault' will run on the unexpanded VIC and 'Mowermania' will be running on the VIC with 8K expansion.

'Altair 4' is for the 64 and occupies 52K. A machine code program, this is an adventure game. No release dates have yet been announced for the latter three games but Acme have promised that all their games will cost £5 each. The company are also willing to talk to other games programmers because they want to launch games as fast as they can.

Husband and wife team Alan and Soo Maton of Acme Software

Contact: Acme Software Limited. 49/51 The Albany, Old Hall Street, Liverpool, Merseyside L3 9EJ. Telephone: 051 236 8062.

Plot a path to successful CAD

Pathplot is a piece of software that is split into two sections and, in conjunction with Pathtrace, can form part of a computer aided design system. In the geometry section of Pathplot, the programmer constructs the component profiles on screen which are then verified via display on the hi-res VDU.

These drawings can then be mirrored, scaled, rotated or translated as required. Once the component has been defined, the features can then be stored on disk for future recall during the other design stages.

The other section of Pathplot is called the offset section and it is in this section that the profiles are recalled from disk and the programmer specifies the tool diameter, direction or motion and whether internal or external offset is required. The path is then calculated and stored on disk. Several of these paths can be made on each profile.

Once the geometry and offset files have been created, each file is processed through a machining section, and CNC program produced. Two plotting options are available, these being Superimposed plot and Dimensioned plot.

The first option allows a series of geometrical and offset files to be superimposed on the VDU to create a drawing which can be output via an XY plotter.

The latter option provides for one geometrical or offset file to be output complete with dimensions.

Contact: CAD, Pathtrace Limited, 5/9 Portsmouth Road, Cobham, Surrey KT11 1JG. Telephone: 093 26 5313.

Educational pack from Chalksoft

Chalksoft have reworked all their tapes for the VIC 20, except the Super-Expander, so that they can be used with any expansion pack from 3K to 16K. Their current software for the VIC is made up of Inkosi, Invisible Man, Metrics, Pascal, Sequences and has recently been reinforced by Decimals, all of which are educational packages.

Inkosi is designed to stimulate thinking and group discussion because the idea is to determine how you are going to manage your food supply, bearing in mind things like drought or population explosions may occur. The cost of this is £5.95.

In Invisible Man, a cartoon character is drawn and then hidden. There are three levels of difficulty and the man must be found before time is up. Clues to the whereabouts of the man are given by compass directions. The cost of this is £5.95.

More on education

Metrics is a set of five programs designed to give practice in the vocabulary and the use of the metric system. The five programs each cover mass, capacity, area, length and volume and the questions come in a multiple choice format. The cost of this game is £9.95.

At £5.95 Pascal is a set of two programs which show the construction and properties of Pascal's triangle and then tests the users knowledge of Pascal.

Sequences also costs £5.95 and is a demonstration of number patterns and explains some complicated mathematical principles.

Contact: Chalksoft, Lowmoor Cottage, Tonedale, Wellington, Somerset TA21 0AL. Telephone: 082 347 7117.

Shark teeth

To accompany the Mator 5¼" Shark Hard Disk Unit, Mator Systems Limited have announced an integral tape back-up system. This tape comprises Ansi-standard, quarter inch, removable magnetic tape cartridges. The system is linked directly to the Shark and is controlled by an extension to the Shark DOS.

This new version provides 10 and 15 Mbyte storage and forms a complement to the other Shark units which extend up to 120 Mbytes in capacity. The new unit offers either emulation of Commodore DOS or compatibility with CP/M based systems or its own file management system.

Contact: Mator Systems Limited, 134/140 Church Road, Hove, Sussex. Telephone: 0273 720451/2.

64 software

Why put up with second best when we can offer you a real choice of software for your Commodore 64? Here are some of the 250+ GAMES:

■ **3D Time Trek** ANRG 5.75 ■ **Arcadia 64** IMAG 5.50 ■ **Attack of the Mutant Camels** HES r25.00 LSFT 6.74 □ **B1 Nuclear Bomber** AHGC 11.50 □ **Choplifter** BBND r27.00 □ **Combat Leader** STSI warg d29.00 □ **Early Games series for Children** (5) CONT d21.00 21.00 ■ **Falcon Patrol** VIRG 6.95 ■ Final Flight MMG fsim d23.00 23.00 ■ **Fort Apocalypse** SYNP d23.00 23.00 □ **Glaxions** OLA 7.75 ■ **Grand Master** ADGC chess 17.95 □ **Gridrunner** HES r29.00 LSFT 5.00 □ **Hexpert** ANRG 7.75 ■ Hover Bovver LSFT 6.75 □ **Hungary Horace** MELH 5.75 □ **Hustler** BB 5.99 ■ **Jump Man** EPYX d27.50 27.50 □ **Kaktus** SSFT d10.00 8.00 □ **Knights of the Desert** STSI warg d29.00 29.00 □ **Laser Zone** LSFT 6.75 □ **Mangrove** SSFT d10.00 8.00 ■ **Matrix 64** LSFT 6.75 □ **Midway Campaign** AHGC warg 11.50 □ **Monopole** RAB 5.75 □ **Moon Buggy** ANRG 7.75 □ **Motor Mania** ADGC 8.95 □ **Munchmam** SOLA 7.95 □ **Nukewar** AHGC 11.50 □ **Purple Turtles** QUIK 7.95 □ **Quest of Merravid** MART 7.75 □ **Quintic Warrior** QUIK 7.95 ■ **Renaissance** ADGC 8.95 □ **Scramble 64** INTM 6.75 □ **Seafox** BBND d29.00 ■ **Shadowfax** POST 6.75 □ **Silicon Warrior** EPYX r29.00 □ **Siren City** INTM 6.75 □ **Snooker** VISN 8.95 ■ **Stix** SSFT 8.50 □ **Super Dogfight** TERM 9.50 □ **Tank Atak** SSFT d10.50 8.50 □ **The Fabulous Wanda ...** GAMA 7.95 □ **Vortex Raider** INTM 6.75 □ **Yahtcee** ANIK 7.95 ■ **Zaxxon** DSFT d27.00 27.00 ... plus STAK lightpen games: ■ **Draughts, Go, Life, Lost in the Labyrinth, Othello, Seek & Destroy, Shuffle 5.75** (lightpen 28.00)

The software lists show, in order: the product **name/producer/price prefix** (to indicate cartridge-<r> disk-<d> and no prefix for cassette. Producers are abbreviated (SSFT: Supersoft) for identification, and help to identify like-named products for price checking or ordering. The product types where differing slightly from others in the same grouping are: **ass(3)(u):** three-pass assembler (+utilities) **comp:** compiler **dbu:** database (code)writer **intf:** interfac **madv:** mystery adventure **mon(a)(u):** monitor (+assembler) (+utilities) **pred:** programming tutorial **prog:** programming utility **sadv:** space adventure **stat:** statistics **txed:** texteditor **wpt:** wordprocessing + terminal software **wpu:** wordprocessing utility or link program.

PLEASE SPECIFY CHOICE OF DISK <d>
CARTRIDGE <r> OR CASSETTE

DATAFILES/DATABASES

■ **CodeWriter** DYNA dbu d85.00 □ **Combined Database** ANIK 12.95 □ **Data Manager** TIME d18.00 18.00 ■ **Diary 64** KOBR r40.00 □ **EasyFile** CBM d75.00 □ **FCM** CONT d35.00 □ **Home Inventory** CRTV 10.75 □ **Infomast** RAB dbu d90.00 □ **Inquire-Pac** IMPX d45.50 □ **Magpie 64** ADGC dbu r95.00 □ **MicroFiler 64** STAG d68.99 ■ **Oracle 64** KOBR d100.00 □ **Research Assistant** TOTL d30.00 27.00 □ **Simple File** SISO d69.00 ■ **Superbase 64** PREC dbu d97.00 ■ **The Recipe Box** ARM d15.00 □ **TOTL. Time Manager** TOLT d30.00 27.00

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□ **Bailiff** SULI 9.95 □ **Besieged** SULI 9.95 □ **Biology** CBM 9.99 □ **Chemistry** CBM 9.99 □ **English Language** CBM 9.99 □ **Face Maker** SPNK r24.00 d25.00 □ **Geography** CBM 9.99 □ **Get it Right** SULI 9.95 □ **Golden Apple** SULI 9.95 □ **Grammer Tree 1** SULI 10.95 □ **Grammer Tree II** SULI 10.95 □ **Grammer Tree III** SULI 10.95 □ **Happy Tutor Typing Aid** IMPX d14.00 14.00 □ **Hey Diddle Diddle** SPNK d21.50 □ **History** CBM 9.99 □ **Just a Mo** SULI 9.95 □ **Kindercomp** SPNK r21.00 d21.50 □ **Masterbard I** SULI 12.95 □ **Mathematics I** CBM 9.99 □ **Mathematics II** CBM 9.99 □ **Memory Trainer** EINS d42.00 □ **Micro Addition** HAYD d21.00 21.00 □ **Micro Division** HAYD d21.00 21.00 □ **Micro Multiplication** HAYD d21.00 21.00 □ **Micro Subtraction** HAYD d21.00 21.00 □ **Patrick Moore: Astronomy** CBM 9.99 □ **Physics** CBM 9.99 □ **Quizagon** CPNT d29.00 □ **Rhymes & Riddles** SPNK d21.00 □ **Speed Reader II** DUSN d47.50 □ **Time Traveller** SULI 9.95 □ **Towering Inferno** SULI 9.95 □ **Turtle Trainer** HES r28.00 □ **Turtle Tutor** HES r28.00 □ **Typing Tutor + Word Invaders** ACDM d18.00 15.50 □ **Wordmaster** SULI 9.95 □ **Wordpower** SULI 9.95

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Incorporated by THE SOUTH-EAST SOFTWARE CENTRE

Shorter circuiting

Bicc-Vero Electronics have produced a wiring kit for all those people who like to wire up circuitry.

This kit comprises of Speedwire terminals which are mounted on a circuit board to provide component sockets on one side of the board and insulation displacement terminals on the other. A special pen called the Speedwire pen pushes an insulated solid conductor wire between the tines of the Speedwire terminal.

The component socket of the Speedwire terminal provides a four jaw contact positioned to wipe on all the four faces of the IC lead. This kit contains one populated eurocard, one eurocard design layout sheet, one wiring pen with a spool of wire and one pair of Speedwire cutters.

Also from the same firm comes a DIY kit which enables you to build your own casing in which to house your circuitry.

This is called the Total Access Case and it has been designed to cover all applications that require a stylish top case. The total accessibility is achieved by unscrewing the four screws in the side panels. Accessories to the kit include a chassis plate, mounting kit and a fan.

Contact: Bicc-Vero Electronics, Parr, St. Helens, Merseyside WA9 1PR, telephone 0744 24000.

Upgrade 8032 to an 8096

SM Software, the creators of the Commodore LOS-96 Operating System, have developed an expansion for the 8032 and the 8032-SK. The expansion board, which was actually developed in West Germany, is 64K and enables the user to upgrade the 8032 to an 8096 whilst retaining full compatibility with all 8096 software.

This expansion board does not obstruct the ROM sockets on the 8032 and is very easy to install as it does not require any modification to the motherboard. The integrated circuits are of the plug-in type and there are facilities for further expansion.

To the end-user one of these boards will cost £300. This expansion board carried a guarantee for one year.

Contact: SM Software UK, Raglan House, 56 Long Street, Durnsley, Gloucestershire, England, telephone: 0453 46065.

Generate programs

Codewriter is a program generator for the 64 and 8000 series which allows you to create your own software. Produced by Dynotech Microsoftware, the only skill you need besides programming is typing, because all you have to do is type in the information you want on the screen using everyday language.

Once you have completed your design the program code is written and stored on disk. Running the self-created program does not need the help of Codewriter.

With the help of this Commode Approved Product it is possible to devise a series of programs to your own requirements instead of hiring a programmer to produce expensive tailor-made software or buying an 'off-the-shelf' product which may fall short of your specific needs.

Contact: Dynatech Microsoftware, Summerfield House, Vale, Guernsey, Channel Islands, UK, telephone: 0481 20155.

Joining forces for an education course

Pergamon Infotech have joined forces with Digital Research to announce a new game called the Microcomputer Education Programme.

The aim of the course is to provide a comprehensive training programme for business and professional users of CP/M and associated system software, languages and development tools. Five of these courses are to be held in London or Manchester early in 1984.

Two of the courses will last for two days dealing with CP/M-86 and advanced graphics and the use of spreadsheets under CP/M. A one day course will introduce the programming language LOGO and two week long courses will teach PASCAL/MT+ and the language C.

The fees for the course are as follows: The one day course costs £80; two day courses cost £130; courses covering the whole week cost £250. All of these fees are subject to VAT.

Enquiries should be directed to Pergamon Infotech, Berkshire House, Queen Street, Maidenhead, Berkshire SL6 1NF telephone 0628 39101.

BBC go soft

The BBC have launched their latest service, the Telesoftware service, which enables users of the BBC computer with a special Teletext adaptor to load programs stored on the pages of Ceefax.

Much of the software takes the form of educational programs, the remainder comprising mainly of utility programs. These programs, of which there are about half a dozen, will be changed every two weeks.

At the moment the bulk of the material on the service comes from the BBC themselves although software will be commissioned out in the future as the system develops.

The cost of the service will be 399 for the BBC micro plus 225 for the adaptor.

The service, which the BBC claims to be the first of its kind in the world, was officially launched in September by John Butcher, the Parliamentary under-Secretary at the Department of Industry.

The BBC claim that the service is not in direct competition with the telephone bound service, Micronet 800 which also enables the user to download programs from a master database.

Mr Micro's RAM dam

Mr Micro have produced an adaptor for the VIC called the 'RAM Dam' which should overcome loading problems that often occur when games requiring 3k expansion will not work with 8k or 16k expansion.

The idea behind this is that the adaptor, when used in conjunction with a Commodore 8k or 16k RAM pack, will fool the machine into believing that it has only 3k fitted.

This means that owners of the 8k or 16k RAM packs for the VIC do not have to purchase a 3k expansion pack to access programs which require 3k. The cost of this adaptor is £13.95 including VAT.

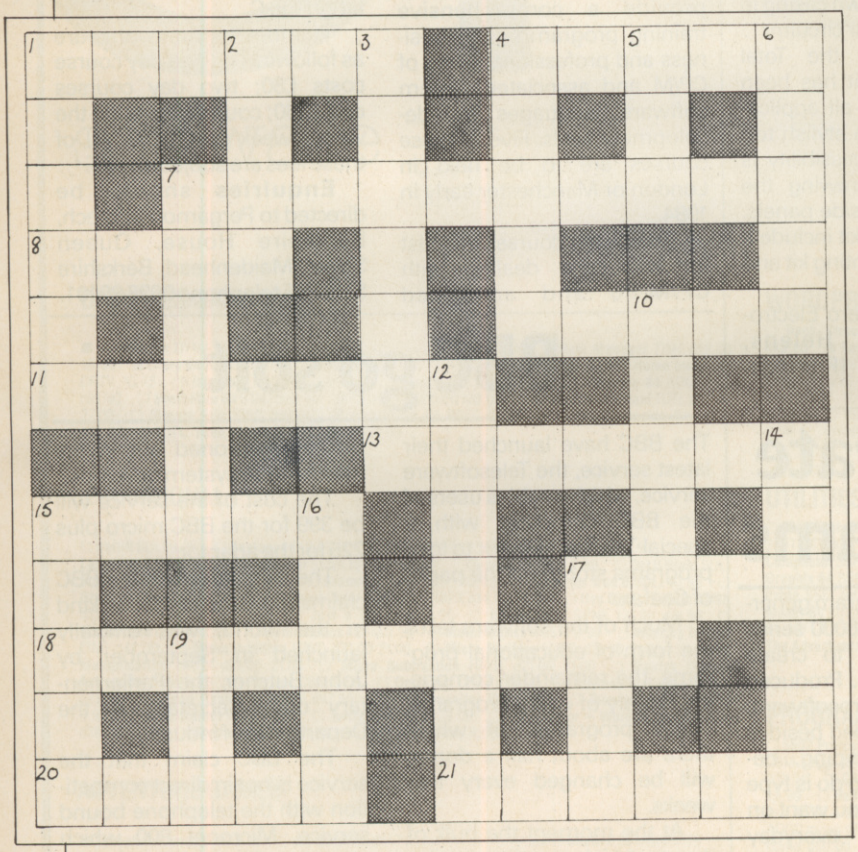
To add to the value of the package, Mr Micro have included a game called 'Micro-vaders' which will also act as a test program just in case VIC owners want to test their 16k RAM before using RAM Dam.

Contact: Mr Micro, 69 Partington Lane, Swinton, Manchester M27 3AL, telephone 061-728 2282.

PUZZLES

The temptation was too much. For the rest of the year Commodore Computing International is a fairly serious magazine. But Christmas is the time for a little light-hearted entertainment. So here's a page of puzzles. There's even a chance to win a prize!

There are two levels of difficulty to the Crossword. You can tackle it in the normal way in which case we think you'll find it fairly easy, but hopefully not too easy. Or you could try doing it with your eyes closed!



1) Start with a Commodore machine in 3/4 time and you will become one to whom something happens.
4) An illuminating contest, they agree.
7) No Pepsi, son? That means nasty letters.
8) Basically, a look inside.
9) Keen sighted bird feels under par.
11) Conrad I call extreme.
13) How can a statue be free?
15) Disables so he gets the reverse of curse.
17) Lou's muddled up a heartfelt song.
18) Train a charged particle to give a facial indication of feeling.
20) In this barren idea is a backward eater.
21) When PE is relative ...

DOWN
1) This evening the star says his prayers in the sixth canonical hour.
2) Into Oklahoma, taken past tense situation.
3) Tuneful computer assists learning about melodious drama.
4) I'm in certain meat.
5) Connection between a neck and a knot.
6) He has tea in a hurry.
7) Inventor of a Commodore machine sells his wares.
10) This woman with problem hair literally petrifies you.
12) I sail on to form a link.
14) This colourful fellow initially starts with a question.
15) Making money from flour and water?
16) Send the cattle in a different direction. Turn the cattle.
17) You in Soap? I'll drink this to that!
18) A jokey sort of crossword, without the anger. (And that's the last clue – and the last example of one of these!)

Finally the puzzle with a prize – a year's subscription to Commodore Computing International.

One criticism of computers is that they tend to make people think too logically. We thought we'd therefore approach this puzzle illogically! Here are the answers to a number of questions. We want you to provide the questions!

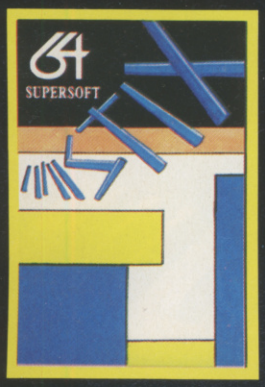
The winner of the competition will be the reader who provides, in the editor's view, the most imaginative questions. Needless to say the editor's decision is final and no correspondence can be entered into. Closing date for entries is Friday December 30. Send your entries, marked 'Puzzle' to the editor.

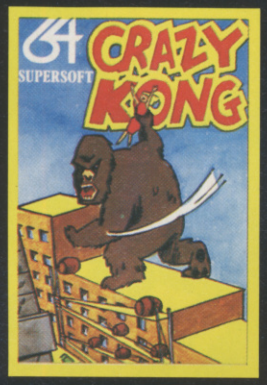
1) 42
2) MC^2
3) 3.142857 in the sky
4) Light program
5) Constantly variable
6) Loop the loop
7) Mouse and bug
8) a: both; b: none
9) 1952
10) Pascal's Triangle.

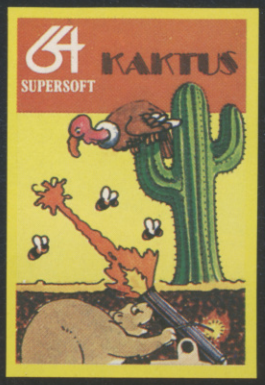
ANSWERS TO THE CROSSWORD PUZZLE WILL APPEAR IN THE NEXT ISSUE OF COMMODORE COMPUTING INTERNATIONAL.
Name of the winner of the competition will be published in our February issue.

CAN YOU BEAT OUR GREAT GAMES

We've got the biggest (and best) selection of games for the Commodore 64. We think they're unbeatable







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Connect a Keyboard

One of the major attractions of the CBM-64 is its potential as a musical instrument. There are some excellent keyboards and interfaces on the market for use with the 64 but we decided it would be fun to put together a system ourselves. Here we publish the results of our efforts – we're proud of the results and we think you will be impressed.

You don't need to be a programming genuis or an electronics expert for this project. It is even possible to follow it through without actually understanding what you're doing but we have done our best to explain what's happening as we go along.

The final result will be a mini piano keyboard connected to a CBM-64 capable of producing three voices at any one time. The characteristics of these voices can be changed by altering the waveform to produce all kinds of wonderful special effects. We will be publishing programs in future issues which will enable you to produce a wide range of such effects.

The first part of the article deals with the interface. It may sound complicated to those who have never picked up a soldering iron but all you need is a steady hand and a little patience.

The second part of the article is the program which actually makes the pressing of a key produce a sound. The third part is a Basic program which will enable to change the sound.

The interface to connect the 64 computer to the music keyboard has been made as simple as possible but still allows for future expansion of the system. It uses only five Integrated Circuits and connects via a edge connector and ribbon cable to

PARTS LIST

One 49 key piano-type keyboard (we obtained ours from Maplin Electronic Supplies)

One Vero board (36 strip by 60 hole)
Four 24 pin Integrated Circuit (IC) sockets

One 14 pin IC socket
One 16 pin IC socket
Eight 19-way board plugs
Eight 10-way board sockets
Four 74150 multiplexers
One 7417 or 74LS17 buffer driver
Connecting wire
One 16-way dual-in-line plug
16-way ribbon cable
One 24-way edge connector to fit user port

to a Commodore 64

the user port on the 64. The ribbon cable connects to the interface board with a 16 way dual-in-line plug. If you made the D/A converter in September then you may use that cable. There are no wiring changes required.

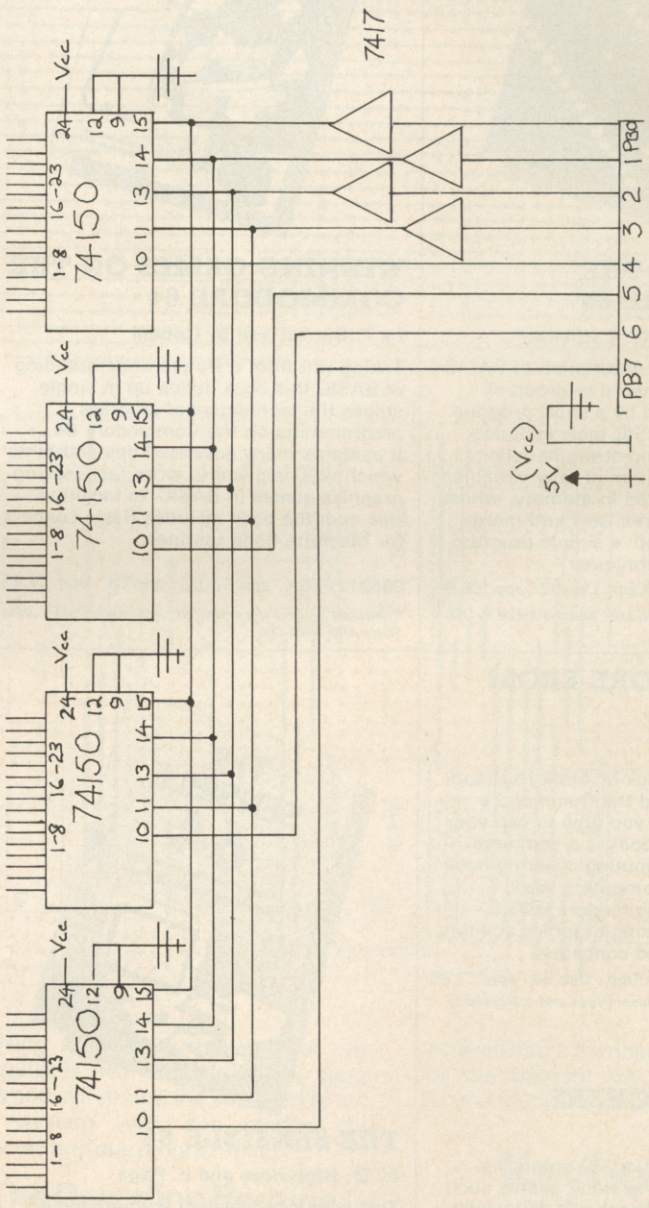
We built the interface on a piece of vero board so if you choose to follow the same construction method we used you will have to do some soldering and mind your fingers when cutting the tracks on under side of the board.

The board uses 4 multiplexer chips. Each one of these can decode a four bit binary number (0 – 15) and use it to select one of it's 16 input pins. If the pin selected is connected to ground (in our case this would mean that the key connected to that input pin was being held down) then the chips outpin pin is set to 1.

On our board all 4 of these chips are fed with the same 4 bit number after it has gone through the buffer chip. The number is fed to the board down the least significant 4 bits of the user port. The upper four bits are used to return the four replies from the multiplexers to the computer.

The program to drive this interface is written in machine code. It scans the piano type keyboard for keys that are held down. As the SID chip only has three voices only the first three keys held down at any one time will produce sound. The program resides at 49152 (C000 hex) onwards and is set into the 64's interrupts. This means that when you initialise the program (SYS 49520) the computer will come back with a "READY" message immediately and will continue working as normal (perhaps a little slower) but if all is well the computer will produce sounds through the tv set when the keys are pressed on the new keyboard.

The program scans the keyboard by sending the numbers 0 to 15 to the least significant 4 bits of the user port and testing the upper four bits for 1's after each number was sent. If one of these bits is sent then it means a key was pressed in the corresponding block of 16 keys on the keyboard (one 16 key block is connected to one multiplexer chip). The number of the key in the block is given by the last number sent to the interface. So the exact key being held down is known, this can then



be used to look up a table for the numbers to be sent to the SID chip to create the correct tone.

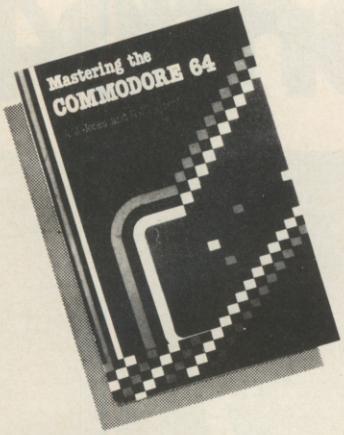
The User Port Connection

Pins numbered 1 to 8 on the dual-in-line plug are connected to C to L on the user port edge connector. Pins 16 and 15 are connected to A and 2 respectively. For user port tables see the CBM-64 User Manual, page 153.

Keyboard Connections

The earth wire which leaves the circuit board from the top left corner connects to the earth bar which is common to one side of all the keyboard switches.

New books for the Commodore 64 and Vic-20



MASTERING THE COMMODORE 64

by **A.J. Jones** and **G. Carpenter**

Commences with a description of BASIC keywords, each keyword or group of keywords illustrated by a short program. The coverage of BASIC tools includes PRINT formatting and string handling. There is an explanation of how variables and strings are stored in memory, whilst simple data structures, sort and merge data list are included: a simple program illustrates these techniques.

0853126542 app. 260pp Dec'83 app. £6.95

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WINNING GAMES ON THE COMMODORE 64

by **T. Barrett** and **S. Colwill**

Taking you from a simple understanding of BASIC this book builds up in single stages the techniques of graphics programming on the Commodore 64. It contains many advanced tips and hints which will help you to write fast-moving graphics games in BASIC. to facilitate this end, the book includes Basic Loaders for Machine Code routines.

085312695X app. 130pp Jan'84 app. £5.95

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by **T. Barrett** and **A.J. Jones**

This book is a collection of games which can be played on the VIC-20. After reading the machine user's manual, you should have no trouble in keying in and running the programs: the text is supplemented by a chapter on redefining graphic characters, containing detailed instructions on the character generator program CHARGEN.

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GETTING MORE FROM YOUR 64

by **Mark Harrison**

This — the third book by Mark Harrison — takes you beyond the Commodore manual and shows you how to use your 64 to the full. The book is a complete introduction to computing covering how the 64 and other computers work, programming in Commodore BASIC, using the 64's dazzling graphics abilities, sound and advanced concepts.

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VIC-20 MINDSTRETCHERS

by **Ian Creasey**

In this book, you'll find 30 programs ranging from exciting video games such as *Bomber, Alien Attack* and *Munchers*, right through to games of strategy and programs that will make your life as a programmer that much easier. To help you increase your own programming skills it includes a comprehensive section on creating your own programs. How would yours compare with any of these:- *Life* ● *Mastermind* ● *Breakout* ● *Zombies* ● *Submarine* ● *Stepping Stones* ● *Snake* ● *Function Keys* ● *Shrink*?

0905 104 692 app. 160pp Dec'83 app. £5.95

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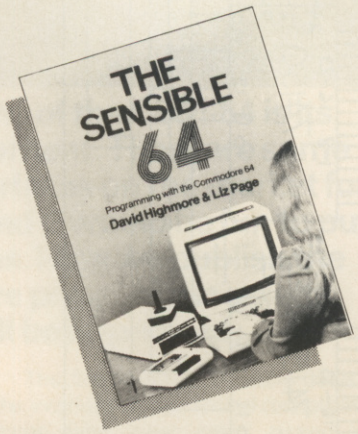

THE SENSIBLE 64

by **D. Highmore** and **L. Page**

This book provides you with a simple, concise explanation of the first sensible computer for business or leisure use. Starting with the more fundamental aspects of this remarkable machine and progressing logically to complex aspects such as using a disk drive, graphic printer, multicolour and Sprite graphics, it covers those topics that are so often only found in manuals or immersed in technicalities.

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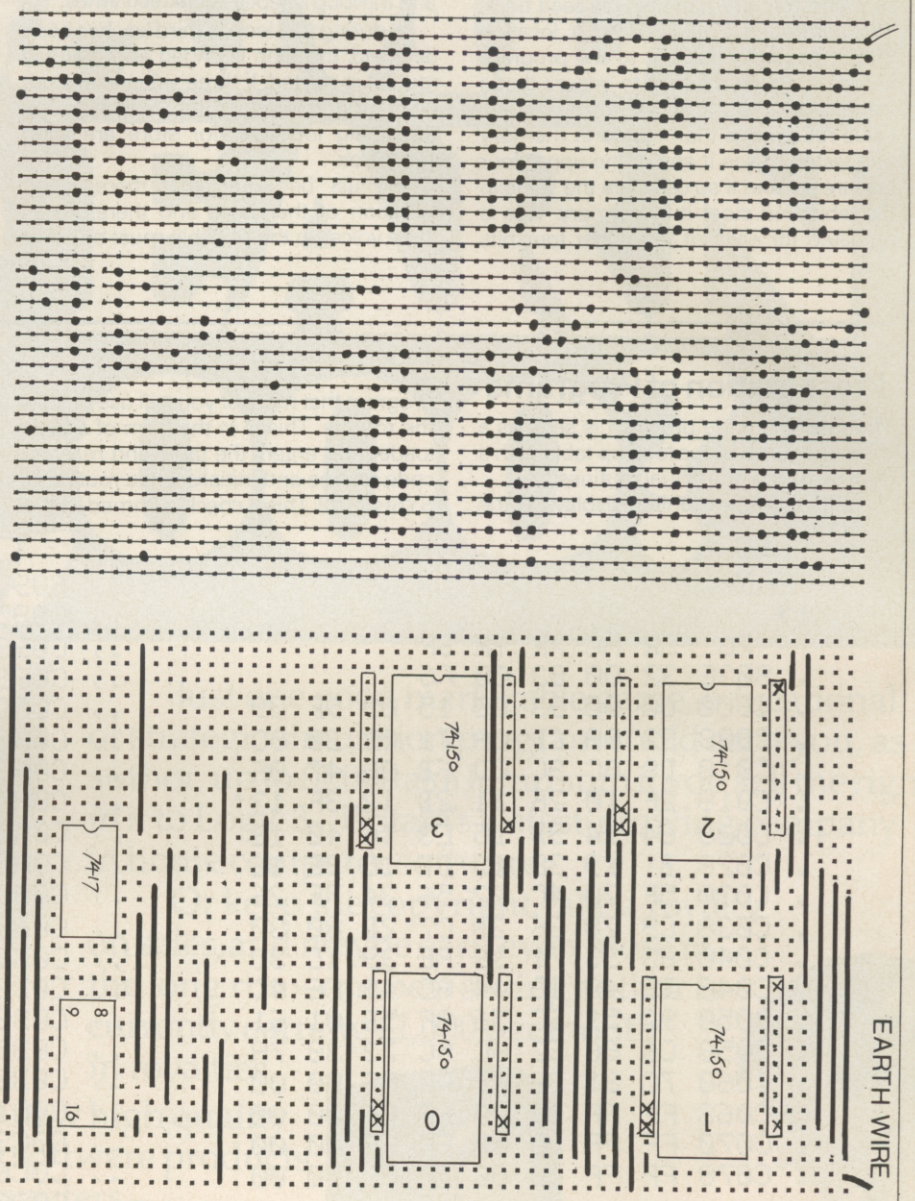
Connect the other side of these keyboard switches as follows:

Start from the left end of the keyboard as you look at it from the front. The wires from the first 16 switches connect to the pins around the top right multiplexer – numbered ? (zero) on the circuit diagram. Note that two pins have been cut from the plugs each side of the multiplexer. The second 16 wires working from the left on the keyboard connect to the 16 pins on plugs at the sides of multiplexer number 1 (one) on the diagram. Wires from the third set of 16 switches are connected to the pins on the plugs at the side of chip number two. The final wire – number 4a – connects to pin 1 on the plug on the right side of chip 3.

Remember that you are working from left to right on the keyboard. But each set of 16 wires from the keyboard switches are connected to each set of pins on the plugs on each chip in clockwise fashion. The first wire, from the extreme left end of the keyboard is connected to the first pin at the top corner of the plug on the right side of chip 0 – bearing in mind, of course, that the first two pins at the top of each plug have been removed.

The eighth wire is connected to the last pin at the bottom of the plug on the right side of the chip. On our diagram of the chip we have numbered the plug pins 1 to 16 to make it even clearer. The pattern is followed on each chip, down the right hand side and up the left hand side.



The Method

The routine that enables the use of the keyboard described in this section is of the simplest form for use of the SID chip. The method of execution of the program, however, is a bit more interesting.

The entry point to the routine is only called once by you. In that routine the actual decoding routine is 'wedged' into the interrupts so that every time an interrupt occurs, the keyboard is scanned and if a key (or keys) have been pressed, the corresponding note is taken from the look-up table and played through the SID chip.

When we say 'every time that an interrupt occurs', we mean about every 1/60 of a second the playing of the notes is updated. Also 'wedging into interrupts' means that the address of the decoding routine is put into the interrupt (IRQ) vector and at the end of the routine, operation is sent to the original IRQ.

Using interrupts means that the computer is free to control Basic programs and still control the keyboard (a two user system with one playing the keyboard and one programming).

The Decoding Routine

The actual routine starts at $C180 (49536 dec). In this routine all the registers are pushed onto the stack, the decoding routine is called ($C0C1), the registers are restored, and a jump to the IRQ routine is executed.

The routine from $C0C1 to $C168 is in two parts: the first part is to read in from the keyboard and decode the values received into a number between 0 and 40 for the relevant key pressed and the second routine plays the note.

Keyboard Program Description

The First Part

In this part, the 16 values mentioned earlier that are sent to the interface are

sent and the returned value is read back. The command LDA (#03,X) at location $C0C6 has no relevance to the program except to create a pause to ensure that a value is returned from the interface. The value returned is then stored in memory and tested to see if any of the upper four bits are set and if so calculate the value in the table and store it in memory. This is repeated for each of the upper four bits and the loop is repeated sixteen times.

If, during this loop, a third key has been detected, the loop is ended and the play routine is started. If three values have not been found within the routine, the remaining locations for store are filled with zero's.

It must be noted that there is no selection of the notes and therefore all three voices in the SID chip must be set to the same. In the next issue we will produce a routine that is selective about the voice it is playing.

The Second Part

In this part, the values received from the first part are taken and converted to the frequencies of the notes via the look-up table and played.

Presentation of Programs

The machine code program is seen as a memory dump of the look-up table with a disassembly of the actual routines.

Following the monitor displays is the program that most of you will use to enter the routine. This is in the form of a Basic loader and enters the table and machine code routine and initialises the routine by SYS(49520). This is check-summed so that if there is an error in the data, you will be informed of it before it can crash the machine.

The last listing is the Basic program that produces the 'vibrato' effect.

```
READY.
B*
   PC   SR AC XR YR SP
.;803E 32 00 83 00 F6
.:C000 00 00 93 08 15 09 9F 09
.:C008 32 0A CD 0A 71 0B 20 0C
.:C010 D8 0C 9C 0D 6B 0E 47 0F
.:C018 2F 10 26 11 2B 12 3F 13
.:C020 64 14 9B 15 E3 16 40 18
.:C028 B1 19 38 1B D7 1C 8E 1E
.:C030 5F 20 4C 22 56 24 7F 26
.:C038 C9 28 36 2B C7 2D 80 30
.:C040 63 33 71 36 AE 39 1C 3D
.:C048 BE 40 98 44 AC 48 FE 4C
.:C050 92 51 6C 56 8F 5B 01 61
.:C058 C6 66 E2 6C 5C 73 38 7A
.:C060 7C 81 30 89 FF FF 00 00
.:C068 FF FF 00 00 FF FF 00 00
.:C070 FF FF 00 00 FF FF 00 00
.:C078 FF FF 00 00 7F FF 00 00
.
.

.; C080  A9 0F     LDA #$0F
.; C082  8D 03 DD  STA $DD03
.; C085  A9 00     LDA #$00
.; C087  8D 05 D4  STA $D405
.; C08A  8D 0C D4  STA $D40C
.; C08D  8D 13 D4  STA $D413
.; C090  A9 F0     LDA #$F0
.; C092  8D 06 D4  STA $D406
.; C095  8D 0D D4  STA $D40D
.; C098  8D 14 D4  STA $D414
.; C09B  A9 0F     LDA #$0F
.; C09D  8D 18 D4  STA $D418
.; C0A0  A9 11     LDA #$11
.; C0A2  8D 04 D4  STA $D404
.; C0A5  8D 0B D4  STA $D40B
.; C0A8  8D 12 D4  STA $D412
.; C0AB  A9 00     LDA #$00
.; C0AD  8D 02 D4  STA $D402
.; C0B0  8D 09 D4  STA $D409
.; C0B3  8D 10 D4  STA $D410
.; C0B6  A9 08     LDA #$08
.; C0B8  8D 03 D4  STA $D403
.; C0BB  8D 0A D4  STA $D40A
.; C0BE  8D 11 D4  STA $D411
.; C0C1  A0 00     LDY #$00
.; C0C3  8C 01 DD  STY $DD01
.; C0C6  A1 03     LDA ($03,X)
.; C0C8  AD 01 DD  LDA $DD01
.; C0CB  85 02     STA $02
.; C0CD  29 20     AND #$20
.; C0CF  F0 0F     BEQ $C0E0
.; C0D1  18        CLC
.; C0D2  98        TYA
.; C0D3  69 11     ADC #$11
.; C0D5  A6 FB     LDX $FB
.; C0D7  95 FC     STA $FC,X
.; C0D9  E8        INX
```

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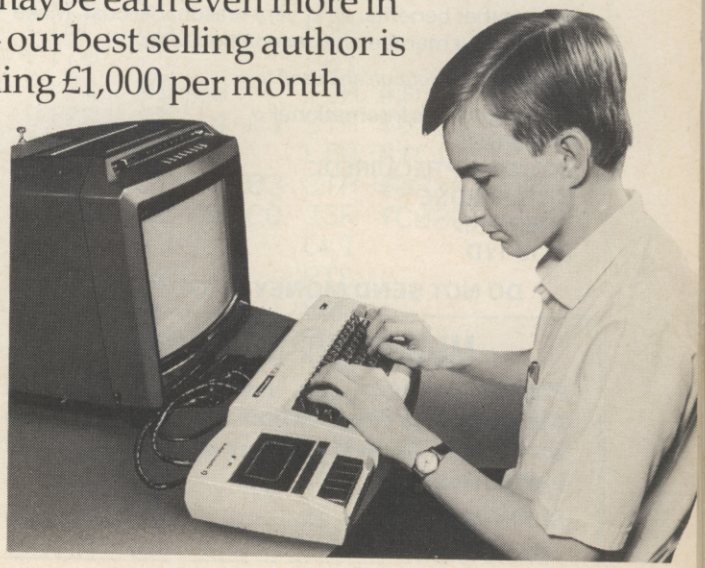

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```
.; C0DA  E0 03     CPX #$03
.; C0DC  F0 56     BEQ $C134
.; C0DE  86 FB     STX $FB
.; C0E0  A5 02     LDA $02
.; C0E2  29 40     AND #$40
.; C0E4  F0 0F     BEQ $C0F5
.; C0E6  18        CLC
.; C0E7  98        TYA
.; C0E8  69 21     ADC #$21
.; C0EA  A6 FB     LDX $FB
.; C0EC  95 FC     STA $FC,X
.; C0EE  E8        INX
.; C0EF  E0 03     CPX #$03
.; C0F1  F0 41     BEQ $C134
.; C0F3  86 FB     STX $FB
.; C0F5  A5 02     LDA $02
.; C0F7  29 10     AND #$10
.; C0F9  F0 0F     BEQ $C10A
.; C0FB  18        CLC
.; C0FC  98        TYA
.; C0FD  69 01     ADC #$01
.; C0FF  A6 FB     LDX $FB
.; C101  95 FC     STA $FC,X
.; C103  E8        INX
.; C104  E0 03     CPX #$03
.; C106  F0 2C     BEQ $C134
.; C108  86 FB     STX $FB
.; C10A  A5 02     LDA $02
.; C10C  29 80     AND #$80
.; C104  E0 03     CPX #$03
.; C106  F0 2C     BEQ $C134
.; C108  86 FB     STX $FB
.; C10A  A5 02     LDA $02
.; C10C  29 80     AND #$80
.; C10E  F0 0F     BEQ $C11F
.; C110  18        CLC
.; C111  EA        NOP
.; C112  A9 31     LDA #$31
.; C114  A6 FB     LDX $FB
.; C116  95 FC     STA $FC,X
.; C118  E8        INX
.; C119  E0 03     CPX #$03
.; C11B  F0 17     BEQ $C134
.; C11D  86 FB     STX $FB
.; C11F  C8        INY
.; C120  98        TYA
.; C121  29 0F     AND #$0F
.; C123  F0 04     BEQ $C129
.; C125  A8        TAY
.; C126  4C C3 C0  JMP $C0C3
.; C129  A6 FB     LDX $FB
.; C12B  A9 00     LDA #$00
.; C12D  95 FC     STA $FC,X
.; C12F  E8        INX
.; C130  E0 03     CPX #$03
.; C132  D0 F9     BNE $C12D
.; C134  A5 FC     LDA $FC
.; C136  0A        ASL
.; C137  A8        TAY
.; C138  B9 00 C0  LDA $C000,Y
.; C13B  8D 00 D4  STA $D400
.; C13E  B9 01 C0  LDA $C001,Y
.; C141  8D 01 D4  STA $D401
.; C144  A5 FD     LDA $FD
.; C146  0A        ASL
.; C147  A8        TAY
.; C148  B9 00 C0  LDA $C000,Y
.; C14B  8D 07 D4  STA $D407
.; C14E  B9 01 C0  LDA $C001,Y
.; C151  8D 08 D4  STA $D408
.; C154  A5 FE     LDA $FE
.; C156  0A        ASL
.; C157  A8        TAY
.; C158  B9 00 C0  LDA $C000,Y
.; C15B  8D 0E D4  STA $D40E
.; C15E  B9 01 C0  LDA $C001,Y
.; C161  8D 0F D4  STA $D40F
.; C164  A9 00     LDA #$00
.; C166  85 FB     STA $FB
.; C168  60        RTS
.; C169  EA        NOP
.; C16A  EA        NOP
.; C16B  EA        NOP
.; C16C  EA        NOP
.; C16D  EA        NOP
.; C16E  EA        NOP
.; C16F  EA        NOP
.; C170  78        SEI
.; C171  A9 80     LDA #$80
.; C173  8D 14 03  STA $0314
.; C176  A9 C1     LDA #$C1
.; C178  8D 15 03  STA $0315
.; C17B  20 80 C0  JSR $C080
.; C17E  58        CLI
.; C17F  60        RTS
.; C180  08        PHP
.; C181  48        PHA
.; C182  98        TYA
.; C183  48        PHA
.; C184  8A        TXA
.; C185  48        PHA
.; C186  20 C1 C0  JSR $C0C1
.; C189  68        PLA
.; C18A  AA        TAX
.; C18B  68        PLA
.; C18C  A8        TAY
.; C18D  68        PLA
.; C18E  28        PLP
.; C18F  4C 31 EA  JMP $EA31
```

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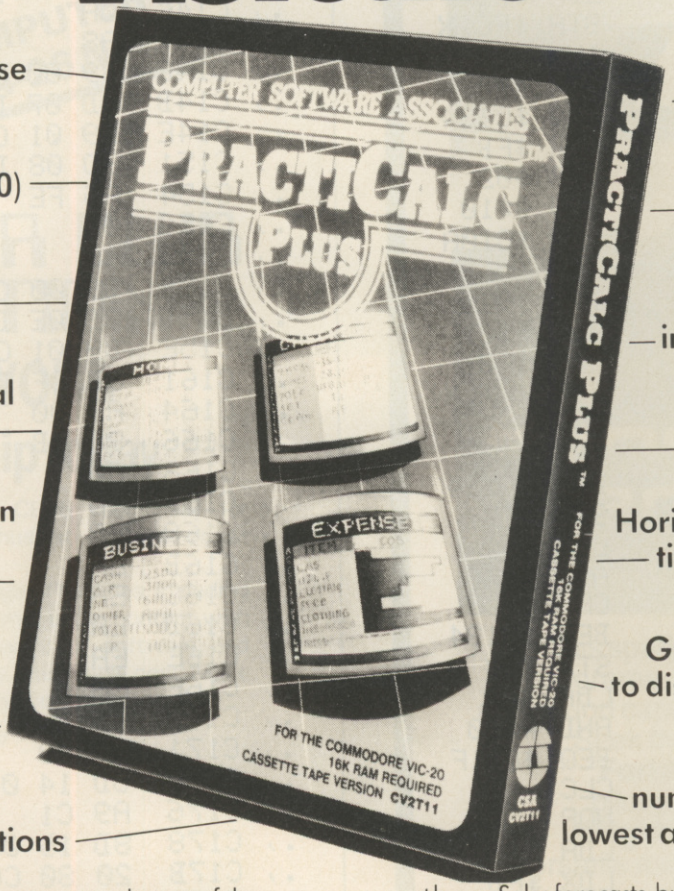

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```
10 I=49152:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:I=I+1:T=T+A
40 GOTO20
50 IFT<>46943THENPRINT"■■■■■DATA ERROR 46943"T:END
60 PRINT"■■■■■■■■■■DATA OK, KEYBOARD NOW ACTIVATED."
70 SYS 49520
80 END
100 DATA0,0,147,8,21,9,159
110 DATA9,50,10,205,10,113,11
120 DATA32,12,216,12,156,13,107
130 DATA14,71,15,47,16,38,17
140 DATA43,18,63,19,100,20,155
150 DATA21,227,22,64,24,177,25
160 DATA56,27,215,28,142,30,95
170 DATA32,76,34,86,36,127,38
180 DATA201,40,54,43,199,45,128
190 DATA48,99,51,113,54,174,57
200 DATA28,61,190,64,152,68,172
210 DATA72,254,76,146,81,108,86
220 DATA143,91,1,97,198,102,226
230 DATA108,92,115,56,122,124,129
240 DATA48,137,255,255,0,0,255
250 DATA255,0,0,255,255,0,0
260 DATA255,255,0,0,255,255,0
270 DATA0,255,255,0,0,127,255
280 DATA0,0,169,15,141,3,221
290 DATA169,0,141,5,212,141,12
300 DATA212,141,19,212,169,240,141
310 DATA6,212,141,13,212,141,20
320 DATA212,169,15,141,24,212,169
330 DATA17,141,4,212,141,11,212
340 DATA141,18,212,169,0,141,2
350 DATA212,141,9,212,141,16,212
360 DATA169,8,141,3,212,141,10
370 DATA212,141,17,212,160,0,140
380 DATA1,221,161,3,173,1,221
390 DATA133,2,41,32,240,15,24
400 DATA152,105,17,166,251,149,252
410 DATA232,224,3,240,86,134,251
420 DATA165,2,41,64,240,15,24
430 DATA152,105,33,166,251,149,252
440 DATA232,224,3,240,65,134,251
450 DATA165,2,41,16,240,15,24
460 DATA152,105,1,166,251,149,252
470 DATA232,224,3,240,44,134,251
480 DATA165,2,41,128,240,15,24
490 DATA234,169,49,166,251,149,252
500 DATA232,224,3,240,23,134,251
510 DATA200,152,41,15,240,4,168
520 DATA76,195,192,166,251,169,0
530 DATA149,252,232,224,3,208,249
540 DATA165,252,10,168,185,0,192
550 DATA141,0,212,185,1,192,141
560 DATA1,212,165,253,10,168,185
570 DATA0,192,141,7,212,185,1
580 DATA192,141,8,212,165,254,10
590 DATA168,185,0,192,141,14,212
600 DATA185,1,192,141,15,212,169
610 DATA0,133,251,96,234,234,234
620 DATA234,234,234,234,120,169,128
630 DATA141,20,3,169,193,141,21
640 DATA3,32,128,192,88,96,8
650 DATA72,152,72,138,72,32,193
660 DATA192,104,170,104,168,104,40
670 DATA76,49,234,-1
READY.
```

The Basic Program

The Basic program that has been included will produce a 'vibrato' effect using the volume register of the SID chip and any time that a key (1 – 4) is pressed, the waveform of all three voices will be changed to one of four different values. These values ae for:

1. Triangle Waveform,
2. Sawtooth Waveform,
3. Pulse Waveform,
4. (Pulse AND Triangle) Waveform.

Apart from noise, these are the only good combinations available.

```
10 S=54272
20 FORI=5TO15STEP1
30 POKES+24,I
35 GOSUB90
40 NEXT
50 FORI=15TO5STEP-1
60 POKES+24,I
65 GOSUB90
70 NEXT:GOTO20
90 GETA$:IFVAL(A$)<1ANDVAL(A$)>4THENRETURN
95 ONVAL(A$)GOSUB100,105,110,115
96 RETURN
100 A=17:POKES+4,A:POKES+11,A:POKES+18,A:RETURN
105 A=33:POKES+4,A:POKES+11,A:POKES+18,A:RETURN
110 A=65:POKES+4,A:POKES+11,A:POKES+18,A:RETURN
115 A=81:POKES+4,A:POKES+11,A:POKES+18,A:RETURN
120 GOTO100
READY.
```

Computer control

The idea that the homes of the future would be run by computer has not materialised in the way that many people imagined. Instead of one central machine every item of equipment has its own chip. But we were inspired by The VIC-20 Connection written by James Coffron to take a closer look at computer control

If you have recently bought a VIC-20, and all you have managed to do so far is run a few games, try your hand at a couple of simple quizzes and maybe had a look at one or two of the many wordprocessors available you may be wondering what has made the VIC 20 a best seller.

Well, of course you can have excellent software packages and hardware add-ons which, some people will claim, make the computer a best seller. This would only be true if one fact was overlooked. The hardware add-ons and software are only available because the computer has the ability to make use of them in certain applications and that the VIC is a very versatile machine. Applications go far beyond the wordprocessors which come fifteen to the dozen. All the user has to do is stretch the imagination a little bit further than the simple (and ultimately trivial) games which urge you to exterminate the advancing hordes of aliens.

The point is that there are many applications in the home that the home computer can be used for. Have, for instance, you thought about using the VIC to operate a security system, control the temperature or operate a lighting system.

Even beginners, who know next to nothing about computers let alone how to adapt them to various home and office applications can try their hand at computer control.

The term computer control can only be fully explained after it has been realised that there are three necessary ingredients:
1) the controller, ie the computer
2) the controlled object or piece of equipment
3) a means of connecting the controller to the controlled. This is usually performed by an interface in its simplest form, a cable.

It is this cable which permits a two way flow of information. The computer sends the directions to the external piece of hardware as well as receiving information from it. Before this swapping of information and even before a system can be properly designed and implemented, it is essential that the requirements of the system and the task it is designed to perform are accurately and unambiguously defined.

A simple statement of the task is required first such as: 'the computer must control the temperature in the house so that if the temperature falls to less than 25 degrees Centigrade and/or it is between the hours of 7 and 8 in the morning and 9 and 12 at night, then the central heating must be switched on.' The problem is how can it be implemented?

Using an interface is only part of the answer because the information provided by the normal household thermometer is in an analogical form because there is an infinite number of potential values (temperatures). But the VIC is a digital computer and because of the necessity for accurate results, the output of the VIC is limited to predefined states (electrical impulses or the binary logic values of 0 and 1). A series of electrical impulses forms the data.

Thus, somehow the analogical information must be transformed into an electrical impulse which is capable of being decoded by the micro.

This transformation is performed by an electrical device called a transducer which may be bought as a separate unit or (for the electronics enthusiast) made at home. Transducers are necessary for most systems or devices which will not interface directly to the micro and which have an output (analog or digital) which can not immediately be recognised by the micro.

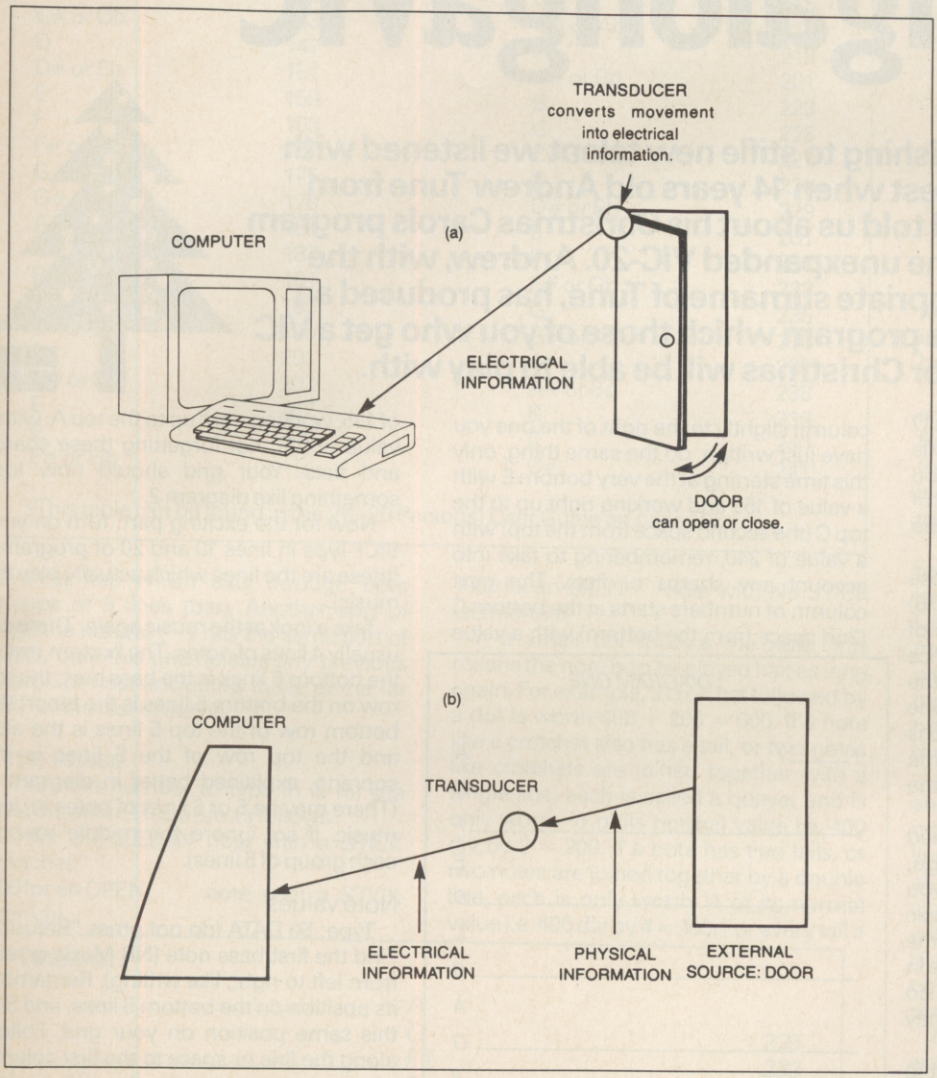
In the case of the thermometer the transducer will act as a temperature sensing device. It will receive two sets of input, one from the micro and one from the thermometer, and will release two sets of output, one to the micro and one to the thermometer. The voltage produced by this device can be related to the temperature by the equation

$$\frac{X^\circ \text{ kelvin}}{100} = \text{Voltage}$$

The remaining set of equations that needed to be included in the program to make the system work will probably require more advanced programming because the above equation has only calculated the voltage and not the actual temperature. The actual result can be achieved by multiplying the voltage by 100 and then by taking away the temperature in degrees Kelvin.

As an example, your result should go something like this, having calculated the voltage to be 3.532 and where degrees Kelvin = 273.2 (or in Centigrade, 0):

$$3.532 \times 100 - 273.2 =$$
$$353.200 - 273.2 =$$
80 degrees C



Top: *The physical movement of the door needs to be translated into electrical information which can be fed into the computer. This is done by way of a transducer.*

Bottom: *This block diagram shows exactly how the transducer fits into the system designed to turn the movement of the door into information which the computer can understand. The transducer's job is to measure or record a physical event. That physical event – the opening of the door, for instance, is the input into the transducer.*
The output of the transducer will be an electrical signal directly related to the physical event and output to the computer.

This feature is based on information from *The VIC-20 Connection* written by James W Coffron and published by Sybex.

The timing device is simply a pulse counter counting in hours minutes and seconds but this device (which is usually built in to the micro) has to be set to the times the user requires. This, of course, means using strings of variables and programming following the format of inputting the message, say under string A$, setting the timer to A$ and then entering the statement. For example, the data in the string in this example should go hours, minutes and seconds in the form 122436. The next step is to start the clock. On the 64, the instruction for this would be TI$=A$ where TI$ is the address of the clock. The final step is the checking device like IF TI$=· . ." then switch the central heating on/off.

Obviously, in a system where no timing is required there is no need to address the timer.

Such a system might be a security device where an alarm is activated by the movement of a door or window. In this case, the micro will need to monitor all the appropriate windows, doors and primary alarm systems and the major ingredient in the program will actually be a drawing of the house. Outside the program, ordinary switches need to be attached so that when the door or window is closed, the switch is closed and conversely when the door or window is open the switch is open. Thus the physical movement of an entrance has been converted into an electrical current which, when relayed back to the micro, sets off a visual and/or audible alarm indicating a breach of security.

Most of the home computer applications will require some method of output and this is a simple matter of interfacing the micro to a compatible printer or monitor and, thankfully, there are many of these available for all micro's.

So now you see that the home computer has a much greater potential than at first meets the eye. Not only is the VIC or 64 capable of dishing out a nasty death to those aliens the Zyglons from Planet 9, but somebody, somewhere, may even be adapting the micro to control the electric cooker, power supply or even a pop-up toaster.

SingalongaVIC

Not wishing to stifle new talent we listened with interest when 14 years old Andrew Tune from Sheffield told us about his Christmas Carols program for the unexpanded VIC-20. Andrew, with the appropriate surname of Tune, has produced an effective program which those of you who get a VIC for Christmas will be able to play with.

The carols, all in three part harmony, are O Come All Ye Faithful, While Shepherds Watched, Silent Night, God Rest You Merry Gentlemen and O Little Town of Bethlehem. The three voices give the tunes some depth.

In case you are wondering why I chose the value of 5 for the volume (POKE 36878) in line 10, this is because with all three of the VIC's voices blaring out at once anything louder would tend to distort the sound. If you are using more than one voice on your VIC a much clearer sound is produced by POKEing a low volume number into 36878 and turning up the volume on the TV set itself.

For programming music you don't need any previous musical knowledge, although it does help. The first thing you need to do if you want to program music into your VIC is not to turn on the computer, but to draw a grid like the one in diagram 1. (The short lines in brackets do not actually appear on the music, but they are necessary, as you will see later.)

Next, take the music which you want to program. Look at the top left-hand corner of the actual lines of music. If there are any # (sharp) or b (flat) symbols, put them in the same places on your grid. (If there are no sharps or flats, don't worry, you're lucky!). Follow along the line or space with the sharp or flat sign on it, and place the symbol (# or b) after the letter. All other letters the same as this one will also have the same symbol then; for instance, if there is a # sign on the very top line of the music, all Fs will become F#; or say, there were b signs on the top space and the middle line on the top group of five lines all Es would become Eb and all Bs become Bb.

Now, starting at the very bottom E with value of 207, to "Middle C" (the c by middle line in brackets) with a value of 240, write in the note values (shown in table 1) alongside the letters, taking into account any sharps or flats. Next, in a column slightly to the right of the one you have just written, do the same thing, only this time starting at the very bottom E with a value of 159 and working right up to the top C (the second space from the top) with a value of 240, remembering to take into account any sharps or flats. The next column of numbers starts at the bottom C (2nd space from the bottom) with a value of 135, working right up to the top A, with a value of 237, not forgetting these sharps and flats. Your grid should now look something like diagram 2.

DIAGRAM ONE

(_____) A
G
_____ F
E
_____ D
C
_____ B
A
_____ G
F
_____ E
D
(_____) C
B
_____ A
G
_____ F
E
_____ D
C
_____ B
A
_____ G
F
(_____) E

Now for the exciting part: turn on your VIC! Type in lines 10 and 20 of program 1 (these are the lines which actually play the music).

Take a look at the music again. There are usually 4 lines of notes. The bottom row of the bottom 5 lines is the bass part; the top row on the bottom 5 lines is the tenor; the bottom row of the top 5 lines is the alto, and the top row of the 5 lines is the soprano, explained better in diagram 3. (There may be 5 or 6 lines of notes in your music. If so, ignore the middle row on each group of 5 lines).

Note values

Type: 50 DATA (do not press "Return"). Find the first bass note (NB Music is read from left to right, like writing). Remember its position on the bottom 5 lines, and find this same position on your grid. Follow along the line or space to the first column of numbers, and type the appropriate number into the computer followed by a comma. Do the same for the tenor note, but this time look up the value in the second column. (Alto can be used instead of tenor, if you prefer, as I have done in program 2). Repeat this process for the soprano, this time look up the note in column 3.

If a note is on a short line of its own, above or below a group of 5 lines, it is shown on your grid as one of the short lines in brackets. If a note is above the bottom group of 5 lines, on a line of its own *with another short line below it,* it is played as the bottom line of the top group of 5. This is shown in diagram 4.

If a sharp (#) or (b) flat sign appears in the music, anywhere other than at the far left-hand side, it makes all the notes following it on the same line or space sharp or flat respectively, until the next

CAROLS

TABLE 1

NOTE:	VALUE:	NOTE:	VALUE:
C	135	G	215
C# or Db	143	G# or Ab	217
D	147	A	219
D# or Eb	151	A# or Bd	221
E	159	B	223
F	163	C	225
F# or Gb	167	C# or Db	227
G	175	D	228
G# or Ab	179	D# or Eb	229
A	183	E	231
A# or Bd	187	F	232
B	191	F# or Gb	233
C	195	G	235
C# or Db	199	G# or Ab	236
D	201	A	237
D# or Eb	203	A# or Bd	238
E	207	B	239
F	209	C	240
F# or Gb	212	C#	241

(This table can be found in the VIC-20 Personal User Guide on page 135.)

dividing line which cuts through both groups of 5 lines (bar). Another sort of sign, the natural ( ) has the same sort of effect, only this one deletes any previous sharps or flats (including those at the far left) for the rest of the bar.

Time values

The next number to type in is for the time duration. These are as follows:

400 for a FILLED-IN note with a STICK (crotchet)

800 for an OPEN note with a STICK (minim)

1600 for an OPEN note with No STICK (semibreve)

If a small dot follows the note, this means the note is to be played half as long again. For example, a crotchet followed by a dot is worth 400 + 200 = 600. If a note like a crotchet also has a tail, or two notes like crotchets are joined together with a single line, each is called a quaver and is only worth ½ of its normal value i.e. 400 div by 2 = 200. If a note has two tails, or two notes are joined together by a double line, each is only worth ¼ of its normal value i.e. 400 div by 4 = 100. For every tail a note has, its duration is halved. For instance a note with four tails would only be worth 400 div by 16 = 25.

If two notes on the same line or space are joined together with a curved line, then their values are added. I apologise if this is sounding too much like a music lesson, but there are still two things to mention: rests and repeats.

Rests are little squiggly lines and small rectangular boxes in the music. They are lengths of time when no note is played. Unless you already have knowledge of music, it is best to just judge these as to what sounds right. In the DATA statements they are represented as three noughts (with commas, of course) and then a time value, eg. 400.

Repeats: if one of the bar lines is double and has two small dots, program in the music as usual, until another double bar line is reached. Then you have to duplicate all the program lines which you typed since the first repeat line. The figures 1 or 2 with a line above part of the music which is to be repeated mean "play first time only" or "play second time only" respectively.

Now a couple of last points. You should end the music with DATA 999,0,0,0.

When you run the program it may seem too fast or too slow. You can alter the speed by experimenting with the time-loop in line 20. For example, if the music was slightly too fast you could try this: ... FORD = OTO D1*1.2: NEXT ... The 1.2 is obviously the number to be played about with.

DIAGRAM 2

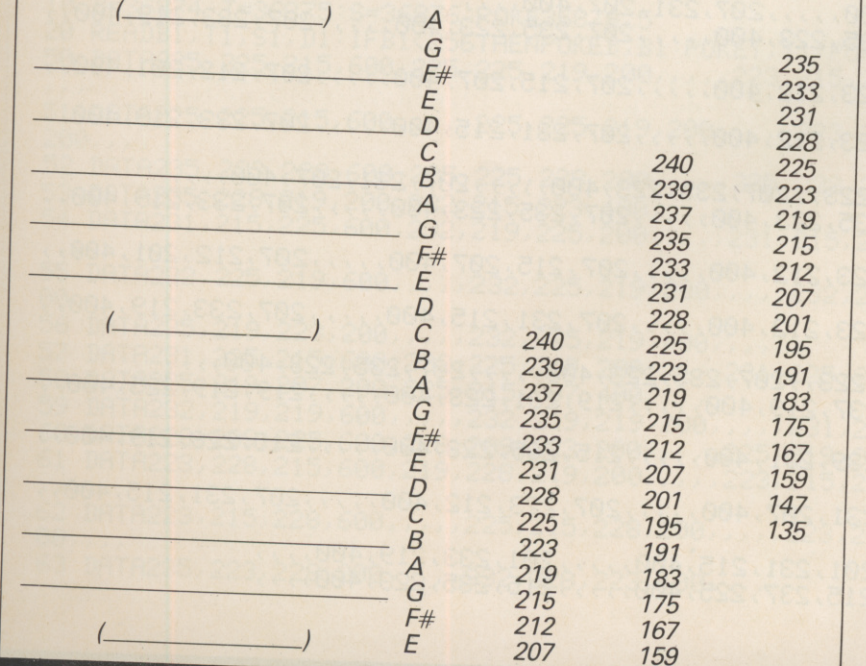


DIAGRAM 3

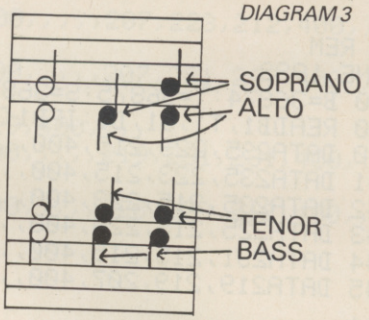
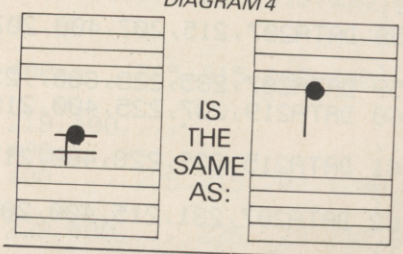


DIAGRAM 4



Andrew is obviously set to be a software businessman of the future. He offers tapes of all six programs for £3. Send cheques payable to K F Tune to Christmas Carols, 9 Heathfield Close, Dronfield, Sheffield S18 6RJ. Applicable to UK only.

CAROLS

```
0 REM                          "O COME ALL YE"        (PROGRAM ONE)          (C) A. D. T
UNE 1983
10 B=36874:T=36875:S=36876:POKE36878,5
20 READB1,T1,S1,D1:IFB1<300THENPOKEB,B1:POKET,T1:POKES,S1:FORD=0TOD1:NEXT:GOTO20
40 DATA235,223,215,400,,,,,235,223,215,800,,,,,235,223,201,400,,,,
41 DATA235,223,215,400,,,,,235,225,219,800,,,,,233,219,201,800
42 DATA235,215,223,400,,,,,233,219,219,400,,,,,235,215,223,400,,,,
43 DATA225,215,225,400,,,,,228,215,223,800,,,,,228,212,219,400,,,,
44 DATA231,215,215,400,,,,,231,215,215,800,,,,,228,219,212,400,,,,
45 DATA219,219,207,400,,,,,228,219,212,400,223,215,215,400,,,,,212,212,219,400,,
,,
46 DATA215,201,223,400,,,,,219,219,212,800,,,,,219,215,207,600,,,,
47 DATA228,212,201,200,,,,,228,212,201,600,,,,200,,,,
48 DATA239,223,228,800,,,,,237,225,225,400,,,,,235,228,223,400,,,,,237,225,225,8
00,,,,
49 DATA235,228,223,800,,,,,233,228,219,400,,,,,233,212,223,400,,,,
50 DATA231,223,215,400,,,,,225,225,219,400,,,,,228,219,212,800,,,,,228,212,201,4
00
51 DATA,,215,400,,,,,,,215,400,,,,,,,212,400,,,,,,,215,400
52 DATA,,219,400,,,,,,,215,800,,,,,,,201,400
53 DATA,215,223,400,,,,,,215,223,400,,,,,,212,219,400,,,,,,215,223,400,,,,
54 DATA,219,225,400,,,,,,215,223,800,,,,,,212,219,400,,,,
55 DATA235,228,223,400,,,,,237,228,225,400,,,,,235,228,223,400,,,,,233,219,219,4
00,,,,
56 DATA231,219,215,400,,,,,228,219,212,400,225,219,212,400,,,,
57 DATA 223,215,215,400,225,215,225,400,,,,,228,215,223,800,228,212,219,600,,,,
58 DATA215,215,215,200,,,,,215,215,215,1600,,,,400
99 DATA999,,,
READY.


0 REM                          "GOD REST YOU"         (PROGRAM TWO)          (C) A. D. T
UNE 1983
10 POKE36878,5:B=36874:A=36875:S=36876
20 READB1,A1,S1,D1:IFB1<256THENPOKEB,B1:POKEA,A1:POKES,S1:FORD=0TOD1/1.5:NEXT:GO
TO20
50 DATA207,,,800,,,,,207,,,400,,,,,207,,,400,,,,
51 DATA207,,,800,,,,,207,,,400,,,,,207,231,207,400,,,,
52 DATA207,231,207,400,207,235,223,400,,,,,207,235,223,400,,,,,207,233,219,400,,
,,
53 DATA207,231,215,400,207,223,212,400,,,,,207,215,207,400,,,,,207,212,201,400,,
,,
54 DATA207,215,207,400,207,223,212,400,,,,,207,231,215,400,,,,,207,233,219,400,,
,,
55 DATA207,235,223,800,,235,223,,207,235,223,400,,,,,207,231,207,400,,,,
56 DATA207,231,207,400,207,235,223,400,,,,,207,235,223,400,,,,,207,233,219,400,,
,,
57 DATA207,231,215,400,207,223,212,400,,,,,207,215,207,400,,,,,207,212,201,400,,
,,
58 DATA207,215,207,400,207,223,212,400,,,,,207,231,215,400,,,,,207,233,219,400,,
,,
59 DATA207,235,223,800,,235,223,,207,235,223,400,,,,,207,235,223,400,,,,
60 DATA219,237,225,400,219,237,219,400,,,,,219,231,223,400,,,,,219,219,225,400,,
,,
61 DATA215,239,228,400,215,239,231,400,,,,,215,235,223,400,,,,,215,228,219,400,,
,,
62 DATA207,231,215,400,207,231,207,400,,,,,207,223,212,400,,,,,207,231,215,400,,
,,
63 DATA201,233,219,800,,,,,201,231,215,400,,,,,201,233,219,400,,,,
64 DATA215,235,223,800,,,,,215,237,225,400,,,,,215,235,223,400,,,,
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65 DATA207,235,223,400,207,233,219,400,,,,,207,231,215,400,,,,,207,223,212,400,,
,,
66 DATA207,231,207,800,,,,,207,231,215,200,207,231,212,200,,,,,207,231,207,400,,
,,
67 DATA201,233,219,800,,,,,201,231,215,400,,,,,201,233,219,400,,,,
68 DATA215,235,223,400,215,237,225,400,,,,,215,239,228,400,,,,,219,231,231,400,,
,,
69 DATA223,233,223,400,223,233,219,400,,,,,225,231,215,400,,,,,228,228,212,400,,
,,
70 DATA231,231,207,2200,,,,,999,,,
READY.


0 REM                        "WHILE SHEPHERDS"      (PROGRAM 3)              (C) A. D. T
UNE 1983
10 B=36874:T=36875:S=36876:POKE36878,5
20 READB1,T1,S1,D1:IFB1<256THENPOKEB,B1:POKET,T1:POKES,S1:FORD=0TOD1/2:NEXT:GOTO
20
50 DATA232,219,209,800,,,,,232,225,219,1200,,,,,232,225,219,400,,,,
51 DATA225,225,215,800,,,,,228,219,209,800,,,,
52 DATA221,228,221,800,,,,,221,228,221,800,,,,,232,225,219,800,,,,,225,225,215,8
00,,,,
53 DATA232,225,219,800,,,,,231,225,225,800,,,,,233,228,225,800,,,,,233,228,223,8
00,,,,
54 DATA225,225,225,2400,,,,,232,225,219,800,,,,
55 DATA238,221,228,1200,,,,,232,219,225,400,,,,,228,221,221,800,,,,,232,225,219,
800,,,,
56 DATA225,225,215,800,,,,,228,219,209,800,,,,,219,219,207,800,,,,,232,219,219,8
00,,,,
57 DATA225,225,215,800,,,,,228,219,209,800,,,,,221,221,209,800,,,,,225,215,207,8
00,,,,
58 DATA232,219,209,2400,,,,,999,,,
READY.


0 REM                        "SILENT NIGHT"         (PROGRAM FOUR)           (C) A. D. T
JNE 1983
10 B=36874:T=36875:S=36876:POKE36878,5
20 READB1,T1,S1,D1:IFB1<256THENPOKEB,B1:POKET,T1:POKES,S1:FORD=0TOD1:NEXT:GOTO20
50 DATA225,225,215,600,225,225,219,200,,,,,223,215,215,400,,,,,225,215,207,1200,
,,,
51 DATA225,225,215,600,,,,,225,225,219,200,,,,,223,215,215,400,,,,,225,215,207,1
200,,,,
52 DATA235,223,228,600,235,225,228,200,,,,,235,223,228,400,,,,,235,228,223,600
53 DATA235,228,219,200,232,215,223,400,,,,
54 DATA231,215,225,600,232,219,225,200,,,,,231,215,225,400,,,,,225,225,215,1200,
,,,
55 DATA232,225,219,600,,,,,232,225,219,200,,,,,232,225,219,400,,,,,237,219,225,6
00
56 DATA235,219,223,200,,,,,232,225,219,400,,,,
57 DATA231,225,215,600,232,225,219,200,,,,,231,225,215,400,,,,,225,215,207,600
58 DATA225,219,207,200,225,215,207,400,,,,
59 DATA232,219,219,600,,,,,232,219,219,200,,,,,231,219,219,400,,,,
60 DATA228,209,225,600,228,209,223,200,,,,,225,219,219,400,,,,
61 DATA223,228,215,600,219,228,219,200,,,,,223,215,215,400,,,,,225,215,207,1200,
,,,
62 DATA223,215,228,600,,,,,225,215,228,200,,,,,223,215,228,400,,,,,235,223,232,6
00,,,,
63 DATA235,223,228,200,,,,,232,228,223,400,,,,
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64 DATA231,225,225,600,232,225,225,200,231,215,225,400,225,225,231,1200,,,,
65 DATA215,207,225,600,,,,,215,207,215,200,,,,,215,219,207,400,,,,,215,201,215,6
00,,,,
66 DATA215,201,209,200,,,,,215,209,201,400,,,,,225,207,195,2400,,,,,999,,,
READY.


0 REM                        "O LITTLE TOWN"        (PROGRAM FIVE)          (C) A. D. T
UNE 1983
10 POKE36878,5:B=36874:T=36875:S=36876
20 READB1,T1,S1,D1:IFB1<256THENPOKEB,B1:POKET,T1:POKES,S1:FORD=0TOD1/1.95:NEXT:G
OTO20
50 DATA233,219,201,800,,,,,235,223,215,800,,,,,240,225,215,800,,,,
51 DATA239,228,215,800,,,,,237,225,219,800,,,,
52 DATA235,228,223,400,235,228,219,400,,,,,231,215,223,400,231,215,225,400,,,,
53 DATA228,219,228,800,,,,,231,215,223,800,,,,
54 DATA219,225,225,800,,,,,223,228,223,400,223,228,215,400,,,,
55 DATA225,231,219,800,,,,,228,228,219,400,228,225,219,400,,,,,235,223,215,2400,
,,,200
56 DATA233,219,201,800,,,,,235,223,215,800,,,,,240,225,215,800,,,,
57 DATA239,228,215,800,,,,,237,225,219,800,,,,
58 DATA235,228,223,400,235,228,219,400,,,,,231,215,223,400,231,215,225,400,,,,
59 DATA228,219,228,800,,,,,231,215,223,800,,,,
60 DATA219,225,225,800,,,,,223,228,223,400,223,228,215,400,,,,
61 DATA225,231,219,800,,,,,228,228,219,400,228,225,219,400,,,,,235,223,215,2400,
,,,200
62 DATA231,223,215,400,231,223,223,400,,,,,223,223,228,1200,,,,,225,215,231,400,
,,,
63 DATA228,228,228,400,228,228,225,400,,,,,231,228,223,400,233,225,219,400,,,,
64 DATA235,223,215,400,235,223,219,400,,,,,231,215,223,400,231,215,225,400,,,,
65 DATA228,219,228,800,,,,,228,212,201,400,225,212,201,400,,,,
66 DATA223,215,215,800,,,,,215,215,223,800,,,,,225,207,219,400,225,212,219,400,,
,,
67 DATA231,215,215,800,,,,,228,212,201,2400,,,,
68 DATA231,215,201,400,233,219,201,400,,,,,235,223,215,800,,,,,240,225,215,800,,
,,
69 DATA239,228,215,800,,,,,237,225,219,800,,,,
70 DATA235,228,223,400,235,228,219,400,,,,,231,215,223,400,231,215,225,400,,,,
71 DATA228,219,228,800,,,,,231,215,223,800,,,,
72 DATA219,225,225,800,,,,,223,228,223,400,231,223,215,400,,,,
73 DATA228,228,219,800,,,,,228,228,219,400,228,225,219,400,,,,,215,223,215,3200,
,,,
999 DATA999,,,
READY.


0 REM                        "HARK THE HERALD"      (PROGRAM SIX)           (C) A. D. T
UNE 1983
10 B=36874:T=36875:S=36876:POKE36878,5
20 READB1,T1,S1,D1:IFB1<300THENPOKEB,B1:POKET,T1:POKES,S1:FORD=0TOD1:NEXT:GOTO20
50 DATA235,223,201,400,,,,,235,223,215,400,,,,,235,223,215,600,,,,,228,219,212,2
00,,,,
51 DATA223,215,215,400,,,,,215,228,223,400,,,,,228,228,223,400,228,228,219,400,,
,,
52 DATA223,228,228,400,,,,,223,228,228,400,,,,,225,231,228,400,,,228,,225,231,22
8,200
53 DATA225,231,225,200,,,,,228,228,223,400,,,,,228,228,219,400,,,,,215,228,223,8
00,,,,
54 DATA235,223,201,400,,,,,235,223,215,400,,,,,235,223,215,600,,,,,228,219,212,2
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CAROLS

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00,,,,
55 DATA231,215,215,400,,,,,228,228,223,400,,,,,226,231,223,400,219,231,219,400,,
,,
56 DATA223,228,228,400,,,,,226,231,219,400,,,,,228,219,219,400,212,219,219,200,2
12,,,
57 DATA212,219,212,200,,,,,215,223,212,400,,,,,219,215,207,400,,,,,228,212,201,8
00,,,,
58 DATA,228,228,400,,,,,,228,228,400,,,,,,228,228,400,,,,,239,228,215,400,,,,
59 DATA231,228,225,400,,,,,235,228,223,400,,,,,228,228,223,400,228,228,219,400,,
,,
60 DATA,228,228,400,,,,,,228,228,400,,,,,,228,228,400,,,,,239,228,215,400,,,,
61 DATA231,228,225,400,,,,,235,228,223,400,,,,,228,228,223,400,228,228,219,400,,
,,
62 DATA225,231,231,400,,,,,225,231,231,400,,,,,225,231,231,400,,,,,228,232,228,4
00,,,,
63 DATA231,231,225,400,,,,,231,228,223,400,,,,,237,225,225,800,,,,
64 DATA,228,219,400,,,,,240,228,223,200,240,228,225,200,,,,,239,228,228,600,,,,
65 DATA235,223,215,200,,,,,228,223,215,400,,,,,228,228,219,400,,,,,235,228,223,8
00,,,,
66 DATA240,231,231,600,,,,,240,231,231,200,,,,,240,231,231,400,,,,,239,228,228,4
00,,,,
67 DATA237,225,225,400,,,,,236,223,223,400,,,,,237,225,225,400,235,225,225,400,,
,,
68 DATA233,228,219,400,,,,,240,228,223,200,240,228,225,200,,,,,239,228,228,400
69 DATA235,228,228,200,235,223,215,200,,,,,228,223,215,400,,,,,228,225,219,400,,
,,
70 DATA235,223,215,800,,,,,999,,,
READY.
```


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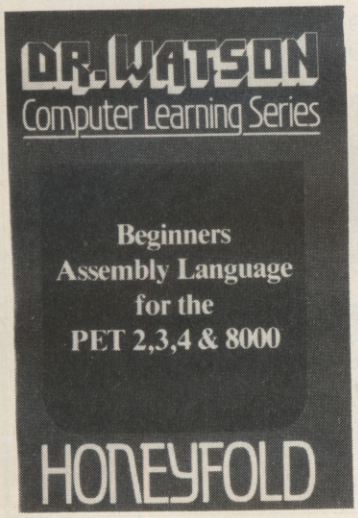

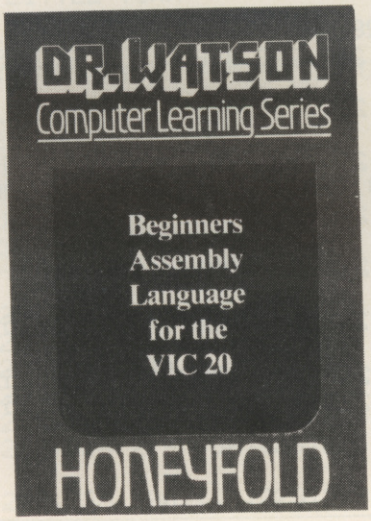

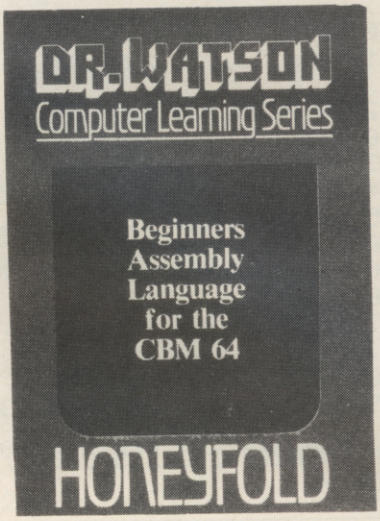

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Best of British words

There are many word processors on the market. Since our business at Commodore Computing International is all to do with words (we use word processors all the time) we feel pretty well qualified to judge a good software package when we see one. We've seen quite a few but we were still impressed by this one from Viza Software.

At long last, here is a word-processor for the 64 that is one step ahead of the vast multitude of other word-processors. Actually Vizawrite 64, produced by Viza Software, is more than just a word-processor because there is also an integrated spelling checker called Vizaspell 64 that comes on both disk and cartridge.

Both are new British products that incorporate the very latest in word-processing design techniques. Vizaspell 64 has a massive dictionary of 30,000 English words and one of the features (well, more of a frill really) of Vizawrite 64 is the ability to change the colour of the lettering, background and border, all to make the screen more relaxing to the eye of the operator. However, when changing the colour, the user can get some very garish contrasts.

Vizawrite is written in 6502 Machine Code and the disk is formatted to be compatible with the 1541 and 4040 disk drive, although an 8050 formatted version is available. This might be a little bit restrictive to the use of the system, but as far as printing is concerned there is very little limitation. Printers supported are the VIC 1525, Epson, Qume, Diablo, Spinwriter, Flowriter and the Triumph Adler TRD170 recommended by its price of £700 if nothing else.

The protocol used to access the printer is provided by an IEEE Serial or Parallel cable.

Loading from disk, the first 'screen' appears while the program is still being loaded. The picture itself sets the standard for the following program, because this is a good use of the 64's graphic capabilities and keeps the user entertained while the rest of the program is loading. Happily, the standards set by this picture are matched if not surpassed.

Like most other word-processors today, this is a menu controlled program which makes good use of the function keys. The main menu which exercises control is the select activity which creates a new file or recalls an old one, provides the user with a disk directory and DOS commands.

Before any information can be input, there are several requirements that have to be met to enable the word-processor to be able to format the text. The basic instructions that are needed simply inform the system of the left and right margins. The necessary information can appear at any position on the screen and even in the middle of text. Upon the creation of a document, this line will appear at the head of page one and the left margin is set at four, the right at 74. This latter margin can be extended up to 240 simply by inserting spaces.

Thus having accomplished this satisfactorily, text will now be formatted as soon as it is entered. Whereas it is beyond the capabilities of Wordpro and Easy Script to perform formatting as soon as the text is entered with the result that they often leave incomplete words at the end of the screen line, using Vizawrite, text is formatted on screen.

But 240 columns do not appear on the screen and what happens once the margins have been reached? Well, as soon as text has gone off the normal screen, side-scrolling comes into effect which means that more text can be entered and if necessary 'word wrapping' comes into operation, ie if a word does not completely fit on one line it will automatically be put on the next. It is possible to see what the formatted text will look like once it has been printed by issuing the width command which will set the right margin back to column 74, this being one of the many very useful commands.

Many of these commands are standard features but, apart from the word-processing commands, there are several display characters which are not standard features but probably soon will be when other producers take note of this product. These are the format symbols and are accessed by the function keys. Using these it is possible to delete text, insert text, move cursors, set the margins and go back and forth from page to page and screen to screen.

Word-processor commands are used to perform a major operation such as moving a block of text or merging documents. These word-processor commands are initiated by the CBM key which prompts the question "Which command?". This is then followed by an initial associated with the required command. For instance, c means copy text from one part of the document to another, p means print the document and r means replace a single phrase with another.

It is highly likely that the user may wish to use a variety of printing techniques, for instance underlining or printing in heavy type. All this can be done using a separate set of format symbols and include the ability to send ASCII code to the printer. ASCII has been incorporated because many printers have additional features that can be selected by sending two or more ASCII codes.

With Vizawrite 64, the numbers 0 to 9 act as the format symbols can be used to send single codes to the printer as long as the correct ASCII code has been assigned previously. This is also done on the format line where the numbers 0 to 9 followed by the assigned ASCII code as in the format 0 = 52.

Printing any sort of document is a fairly complicated process, mainly because Viza Software have included options for just above anything possible. Form feeding cause the printer to space up to the next top of form position and this is not usually allowed for on CBM printers because CBM have a different option called line feeding which performs the same sort of operation. Before anything can be out-put there are several parameters that have to be set such as number of lines per page and whether the stationery used is single sheets or continuous feed.

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Program editing commands :

AUTO	90	Provides automatic line numbering.
DELETE	70	Deletes a given range of program lines.
DUMP	170	Outputs the names and values of all current scalar variables
FIND	200	Lists all lines in which a given character string appears.
FUNC	400	Permits use of C64 function keys.
HELP	160	Prints line in which program error occurred.
LINES	50	Calculates the number of lines in a program.
MERGE	400	Merges a program from tape or disk into the current program
RENU	930	Renumbers a program, altering all GOTO's,THEN's,etc.
REPLACE	490	Replaces all occurrences of one character string with another
RESCUE	40	Recovers a program accidentally 'NEW'ed.
SHRINK	180	Removes all unnecessary spaces and 'REM's from a program
STATS	120	Outputs the number of statements in the current program
TRACE	110	Displays the last six line numbers at the top-right screen
VAR	390	Outputs the names of all variables referred to in a program.

Disk commands :

BASIC4 commands	1970	Comprising APPEND,BACKUP,CATALOG,COLLECT, CONCAT,COPY,DCLOSE,DIRECTORY,DLOAD,DOPEN, DSAVE,HEADER,RECORD,RENAME,SCRATCH.
DERROR	150	Reads the disk error chanel.
DREAD	100	Reads data from disk without input restrictions.
DSEARCH	330	Searches a disk relative-file for a given string or pattern.
TIMEOUT	30	Sets the time-out condition for the IEEE interface.

New BASIC commands :

BLOAD	40	Loads in a block of memory without affecting BASIC execut'n
BORDER	100	Draws a border around the edge of the screen.
BSAVE	120	Saves the memory area between two given addresses.
CALL	80	Enters a machine-code subroutine with given ACC,X-,Y-reg.
CIF,CEND, ELIF,ELSE	220	Four commands which provide facilities for structured BASIC largely eliminating the need for GOTO command.
CLOCK	250	Continually displays the time at a given screen position.
CURSOR	30	Places the cursor at position x,y on the screen.
DATIN	690	Foolproof input routine for dates with full error detection.
DISABLE	50	Disables the run-stop key.
DISP	140	Displays a prompting or warning message on a given line.
EXEC	140	Executes a string as a BASIC command.
GENIN	700	General foolproof input routine with selected key disablement
GSUB	110	Performs a GOSUB to a given labelled line.
GTO	90	Performs a GOTO as above.
INVERT	160	Turns a string back to front.
LWIND	250	Loads a screen display from a compressed format disk file
MOVE	130	Moves a block of memory to another position in RAM.
NUMIN	740	Foolproof input routine for amounts of money.
ON	50	Branches to program line corresponding to key pressed.
PLOT	170	Plots a double-density point on the screen.
POP	30	Removes the last subroutine return address from the stack.
PRINT	130	Adds routine to automatically right-justify amounts of money
PUSH	60	Pushes a return address onto the stack.
RESET	170	Resets a double-density point on the screen.
RESTORE	20	Restores DATA back to a given line number.
ROUT/PER	240	Allows user-defined functions with multiple arguments.
SCAN	190	Scans a string for the next occurrence of a given character.
SEARCH	270	Searches an array for a given string or pattern.
SORT	760	Sorts any one-dimensional array (& tags another array along)
SWAP	440	Loads in another program, retaining all variables.
SWIND	220	Saves the contents of the screen in a compressed disk file.
WPOKE	50	Pokes two memory locations in hi-lo 6502 order.

New functions [like SIN]

AVG	140	Calculates the average of the elements in a numeric array.
BLANK	40	Tests a string ; returns true if the string is blank.
COL$	50	Returns the appropriate colour character for colours 0 to 15.
DATE$	160	Gives a date-string corresponding to a date-number.
DEC	80	Gives the decimal equivalent of a hexadecimal number.
FACT	60	Provides the factorial function.
GAMMA	90	Provides the gamma function.
HEX$	90	Gives the hexadecimal equivalent of a decimal number.
HITBACK	30	Returns true if a sprite has collided with the background.
HITSPR	30	Returns true if a sprite has collided with another sprite.
MAX	120	Returns the maximal element of an array.
MIN	120	Returns the minimal element of an array.
MOD	40	Returns the remainder of one number modulus another.
NORM	160	Provides the normal distribution area function.
PAD$	90	Pads a string with spaces.
QUME$	70	Assists high-resolution plotting on QUME Sprint 5 printer.
SHR$	260	Gives the compressed form of a number for compact storage.
SPC$	30	Gives a string of spaces of given length.
STICK	40	Returns position of joystick.
SUM	130	Returns the sum of elements of an array.
WPEEK	40	Peeks a two byte address.
XPD	220	Decompresses a number.

Printer commands :

PCTRL	100	Sets the device number and characteristics of the printer.
PRINT #	280	Modifies all printer-output according to PCTRL.
SCOPY	340	Copies the screen to the printer.

Other commands :

COMS	460	Prints lists of commands on the cartridge.
DEFINE	220	Allows the user to define his own new commands.
DESIGN	1510	Gives multi-colour sprite editor.
EDIT	70	Adds 'delete-forwards' function.
ERROR	150	Intercepts program errors and branches to specified line.
IRQ	60	Restores normal use of interrupts.
KILL	20	Turns off SOFTCHIP commands.
MON	790	Adds the standard machine-code monitor.
NOKEY	120	Makes selected keys inoperative.
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Global printing is possible by linking all the documents to be printed together as in normal text processing. There are a couple of other options that can be used in conjunction with global printing. Fill means that documents can be filled by merging text from different sources and when this entry contains a global instruction the file entry must contain the name of the next document to be printed.

Once all the necessary parameters have been set, F1 will set the printing operation in motion. While each document is being printed, the current page being printed being visible on the screen at the same time. Pressing the stop key halts the printing.

To round off the whole system, there are helpful prompts and messages in abundance and should the user get stuck there is a document supplied with the system that contains a list of commands and useful information.

Part of Viza Software's back-up service is a registration service which costs £3 per year and entitles the member to periodic newsletters containing further information about Vizawrite products, applications and up-dates.

The cost of the disk based version is £79.35 whilst the cartridge version costs an extra 60 pence. For users of the 64 who want a good wordpro and are not too bothered about the price this is definitely the one to buy.

Supersofts Mikro 64

More and more people are starting to program using machine code or assembly language because of the speed that these languages run at. When assembly language is used in conjunction with the 64, a great many possibilities are opened up as to what to write and where to put it.

I have been using the Commodore Assembler Development System for the 64 for some time and find it much easier to use labels and assemble it rather than to write it using a monitor and have to keep going back to fill in branch locations etc.

Now Supersoft have produced an assembler on cartridge for the 64. The cartridge plus a manual on how to use it costs £50.00 plus VAT.

Getting Started.

All that is needed to start up the assembler is to plug the cartridge into the cartridge port and power up the machine. From there you are ready to use the assembler.

Writing Source Code.

The writing of the source code is as simple as writing a Basic program as long as you know machine code. The operations are entered as a Basic program with line numbers and all branches must go to a label.

The length of the labels is not restricted to 6 characters as is in the Commodore Assembler – I tried a label that was 26 characters long and it worked perfectly.

When the source code has been written, it can be saved on disk or tape just like a normal Basic program and assembled. The file to be assembled must be in memory at the time of assembling, but if you want your program to be several files long you may include a directive at the end of one file to another one that is stored on disk or cassette.

The assembling is done in three passes, and after the third pass, the start and end addresses of the code are displayed and the program has been loaded into memory.

Added Commands

There are a fair few commands added to improve the ease of entering source code. Each of the commands have been tokenised so that only the first letter followed by the shifted second letter need be typed. The obvious ones being AUTO, DELETE, FORMAT (which lists your source code in an understandable format), and FIND. There are other useful commands available such as NUMBER which displays a number in one of four different formats (decimal, hexadecimal, octal, or binary) in all four formats. This will also work with the variables from the source code.

TABLE displays the full label table after the program has been assembled. DISASSEMBLE is used to disassemble a machine code routine to the screen or the printer.

The final and most important command available is the command ASSEMBLE which assembles the program.

Monitor

There is also a version of TINY-MON available which is entered by operating a break or typing TIM. This gives the user a monitor with the usual commands of Memory display, Disassemble, Save, Load, Goto (execute machine code), Hunt memory for value(s), Transfer memory, and exit the monitor back to Basic.

Use of Memory

Because of the fact that a true assembler allows labels, memory is required to store the labels in. This memory is from $A000 to $CF00 and $CF00 to $CFF is a workspace for data storage. This is the only problem as sometimes (more often than not) I use the area $C000 to $CFFF for my own programs. This is not a problem when the program is short as the labels are stored from the bottom up and so may not protrude into the $C000 area but on larger programs this area cannot be used.

Conclusions

At a price of £50.00 plus VAT, I think that it is well worth the money but the Commodore's own assembler is a bit more versatile if a bit slower. I would still invest in a copy of MIKRO 64 anyway because it has some very good points and it supports cassette files which the Commodore Assembler does not.

Configuration: Commodore 64 with disk or cassette.

Contact: Supersoft, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ. Telephone: 01-861 1166.

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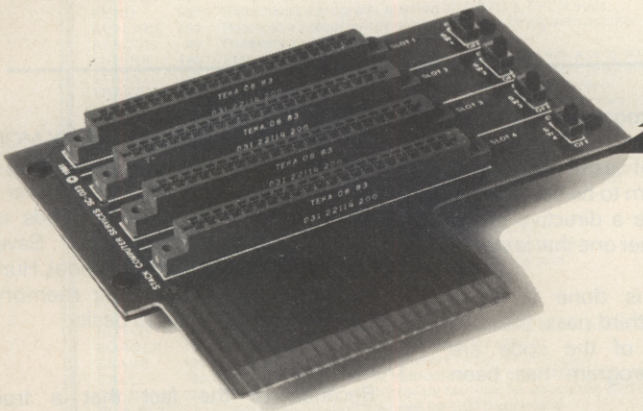

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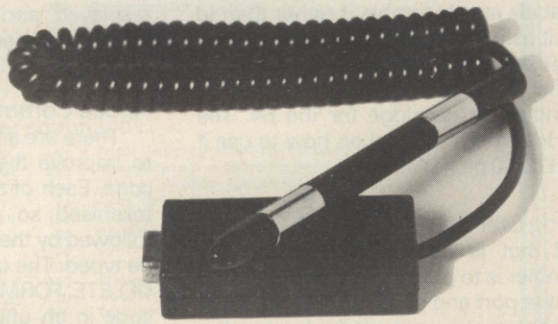

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When you next hear the voice of a Colleen it might not be the dulcet tones of a beautiful girl from the Emerald Isle but the versatile tones of a new music system from Jim Molloy.

One day in the distant future, audiences all over the world could be listening to the London Philharmonic Orchestra playing not the usual wind and string instruments but the VIC and the 64!

A combination of hardware and software that should add a whistle to the voice of any 64 is soon to come out from Jim Molloy and this system is so versatile that it will even allow you to put the resulting tunes through your stereo system.

The system is called Colleen and is made up of a 64, a 1541 single disc drive and the Casiotone MT-11 keyboard.

However it is not restricted to the 64 or the keyboard because it is machine independent. Whereas using a different micro is simply a matter of getting the correct interface cable, a different keyboard presents at least one major problem. The MT-11 is hooked up to the interface box that provides a pulse count provided by a simple timer. This means that the pulses are counted by the space between the time the note was recorded and the time the note dies away. They have also designed a program that calculates the numbers so that a note can thus be recognised by the user not only by the sound that is produced but also in a digital form.

The original interface box that was used worked but it was felt that the results were not satisfactory because of the time it took between depressing the note on the keyboard and the system actually recognising the note. Part of the problem was overcome with the design of a second interface which reduced the time to five milliseconds and the tone of the note is actually sampled five times per second. The frequency of the note is measured in hertz and the second major job of the interface was to convert this frequency as the note built up into a digital format to be shown on the screen built in to the interface box. The frequency rapidly builds up, stabilises and falls away and it is at the point of stabilisation that the true frequency is found and held.

This is all to do with musical wave forms. Using this method of measuring the frequency per note, the time lag between the release of the key and the first sample is practically nil. The crucial factor in developing the system was the time factor. The second part of the problem has, at the time of going to press, yet to be overcome.

This requires the original BASIC program to be converted to Machine Code and because the demonstration program is written in BASIC this is a major reason why it was quite slow.

The demonstration program is a routine written in BASIC at the moment and so it takes quite a long time for the note to be recorded and appear on screen.

The screen display is a simple music stave with a simple tune written into it. This tune is represented by notes on screen and the note pressed by the user is eventually represented on screen. The aim here is to get the user to replicate the tune. If a wrong note is recorded, this will appear above the correct note so, in effect, two sets of notes are displayed – those that are correct and those that are wrong.

This demonstration program would be an ideal aid for teaching the younger child because it means that the user can put the notes on screen just as they would be written on a normal musical score.

Up to this point, all the user has managed to do is use the keyboard to put the notes in. Once the information has been accepted, the tune (no matter how good or bad it is at this stage) can be dumped to disc and played back at whatever speed you want. The first program that will be used will be a demonstration program similar to the one described previously. This set up will be accompanied by the interface lead between the keyboard and the computer as well as a couple of application programs

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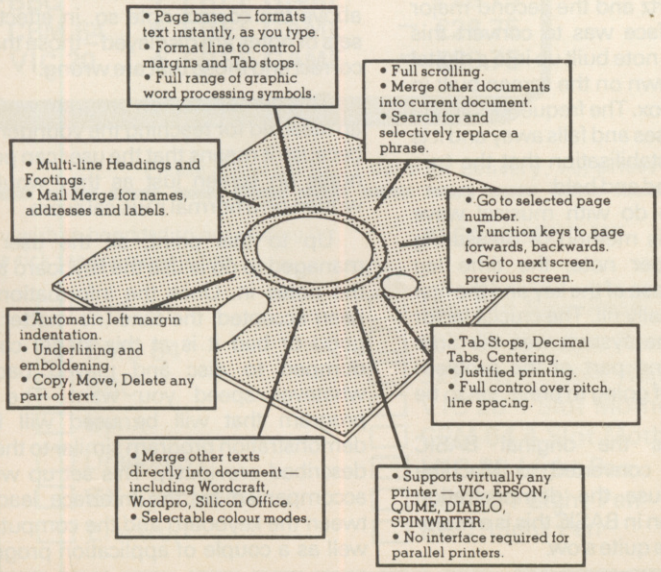

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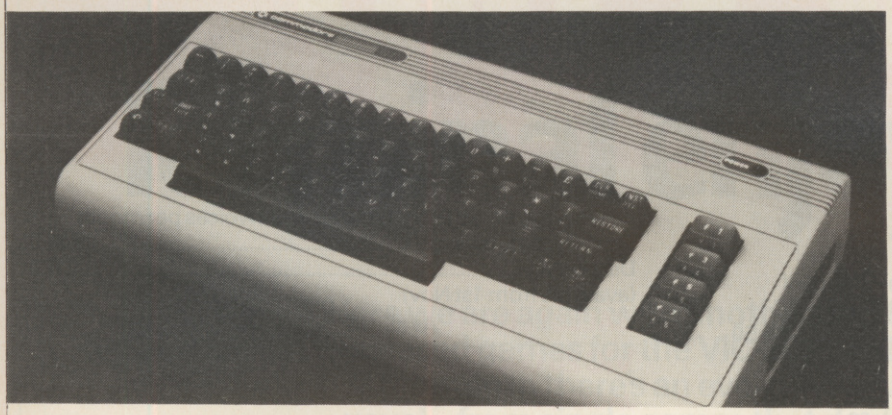


to give the user some idea of how the package can be used to its best advantage.

Other planned appllication programs will enable the system to mix the music produced by say a harp and a violin, text editing of music and a play along tune with the micro.

At the moment it is proposed that the first unit will be powered by batteries although there will also be a power supply unit which can be adapted for use with the unit. This will be available directly from Jim Molloy.

The software will be available on cassette or disc although at the moment the firm details of how information is to be downloaded have not yet been worked out. One of the reasons for this is dependant on the actual equipment used. This means that the actual unit specifications may be subject to change because the equipment has got to be set to like anything.

The problem with using different keyboards lies in the actual quality of the reproduction of the note because the zero reference is set individually for each keyboard. Once this reference has been set, it should be possible for the system to accept anything so long as it is above the threshold levels. If the manufacturers are made aware of the keyboard the system is being used with they can specify the settings, saving the user an awful lot of fiddling about. However, they do suggest that the user sets it to the organ setting as this produces the most stable note.

Out of all the keyboards on the market at the moment, why did the manufacturers choose the Casiotone MT-11? Rather similar in size to the 64, the Casiotone, in the words of Jim Molloy, the musical brain behind the product, "the keys themselves have a very nice feel to them, requiring only the softest of touches." The range of instrumental sounds that the keyboard is capable of producing was also an important factor.

Along with several possible settings for the volume, the keyboard is also switch selectable to vibrato which produces a vibrating effect or sustain which produces the effect of 'holding' a note. The instruments that can be electronically reproduced are piano, pipe organ, violin, accordian, harp, clarinet, organ and electric piano. In fact using the principle of overlaying the music adopted by recording studios where the basic track is recorded first, it is possible to produce a piece of music that seems to involve a whole orchestra.

A motherboard for the VIC-20

Motherboards are most commonly found inside the micro and once they are installed very little can be done with them apart from adding or removing the necessary chip every now and then. Stack have produced a motherboard which is attached to the outside of the micro.

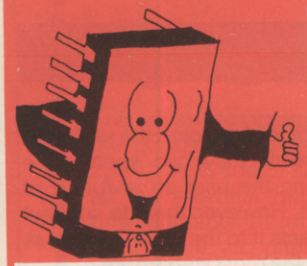
This particular motherboard is for the VIC 20 and is connected simply by plugging into the memory expansion port at the back of the VIC. On the board there are four expansion connectors for cartridges. To prevent damage to the board and the cartridge, the cartridges should be plugged in with labels facing the VIC.

On/off switches

Each of these expansion connectors has its own on/off switch. This is designed so that the user can select individual cartridges on powering up the micro without having to remove cartridges that have conflicting addresses.

As most people should know, the VIC has 65535 addressable locations at which it would expect to find one device. Obviously, not all of these locations are external to the micro and the only locations that are of concern with this motherboard are RAM, ROM and I/O.

The connection of the motherboard should not affect the number of bytes free on the VIC and neither should it affect the consumers spending power too much. The cost of this useful item is just £24. For further information contact Stack on 051-933 5511.



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VIC 20 GAMES AND UTILITIES

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This is it, the ultimate fruit machine for the VIC with nudge, hold and respin, 100% machine code. "Overall jackpot is a beautifully written simulation giving superb graphics, animation and use of colour. In fact, this programme makes Commodore's fruit machine cartridge look unbelievably cheap and nasty." Home Computing Weekly No. 20 19th July 1983 ..... **£5.50**

KWAZY KWAKS:
Accuracy and speed are required for this shooting gallery, superb use of colour and graphics in this new and challenging game from the author of "JACKPOT", 100% machine code program, to the same high standard, joystick or keyboard control. For the unexpanded VIC **£5.50**

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Terminal enjoyment

Here we are again with another batch of recently released games for the VIC-20 and the CBM-64. This month there's an even wider range than usual – from single games that don't challenge reflexes or intellect to those that challenge both reaction time and brain power.

The Catch

To play The Catch from Bubble Bus, all you need is a cassette recorder, micro and monitor. A joystick is optional because you can control the game by using the keyboard. Z will move you to the right and C will move you to the left.

This game will only run on the VIC 20 without any memory expansion. The idea behind the game is to protect your city from the falling bombs which fall faster and faster as the game progresses. You guessed it! You have to protect your city by actually catching the bombs.

This is definitely a game for people who have fast reactions because the bombs are falling over the place at ever increasing speeds and frequencies. The colour of the background changes as the speed increases.

The player gets 10 points for each bomb he manages to catch in his movable shield and records of scores and high scores are kept at the top of the screen.

Quite a good game for a while although the speed of the action is not always appreciated by the eyes.

Pinball Wizard

Terminal Software are back in the news again, this time with a game for the VIC 20 called Pinball Wizard, that makes excellent use of the machine's graphic capabilities, the graphics being absolutely superb, and the four function keys. It is written in 100% machine code for some great fast action. Unlike the previous two games described above, loading is straight-forward.

On the screen, what you are confronted with is basically a pinball machine. There are the usual pinball features and one or two player possibilities.

Four flippers are operated by the logo key and the shift key in the bottom left and right corners of the keyboard and the ball is launched by the 'plunger' which is controlled by F5 and F7. This game is so realistic that you can even alter the speed at which the ball is launched. Many products are accompanied by consumer-deceiving advertising blurb. Happily, this is not the case with this game. It is, as the manufacturers say, pure enjoyment with nudges, rollovers and jackpots and right from the moment you pull back the plunger you begin to realise what an amazing simulation game this is.

Hungry Horace

Originally written for the Spectrum, Hungry Horace can now be played on the 64 and is a little bit like the now famous Pac-Man. Will Hungry Horace follow in Pac-Man's footsteps?

This is not as wild a question as it may first seem because Hungry Horace is undoubtedly a good and occasionally funny game. It is published by Melbourne House who are perhaps better known for their books.

At the start of the cassette is a demonstration program which gives you an idea of the mazes you have to travel through (there are four in all). To actually start playing the game all you have to do is press the fire button or any other key except T and Control. These have a special significance described later.

Written in Machine Language, the aim of the game is for Horace to eat the flowers in the park and withstand the harassment from the keepers. To gain an extra pass for Horace, he must eat 10,000 points worth of flowers. That is a lot of flower eating but there are other ways to bump up the score. You could try eating the keepers lunch and if you steal an alarm bell then the keepers are in a real panic.

Sounds a little ordinary so far, but what about those keys mentioned earlier? The Control key allows you to create and save your own mazes! The user is then confronted with a menu with a list of several options which are selected by the cursor and F1. This puts you in the maze edit mode and from here on you can start to design your own maze. You can have tunnels, flowers, walls, bridges and exits literally wherever you choose to put them. Designs can be saved into memory overwriting any of your other designs for that area of the park.

The T key performs a process which Melbourne House call 'toggling'. Put in simple terms this means that the game will only use those mazes that are redefined, substituting the normal sections of the park otherwise.

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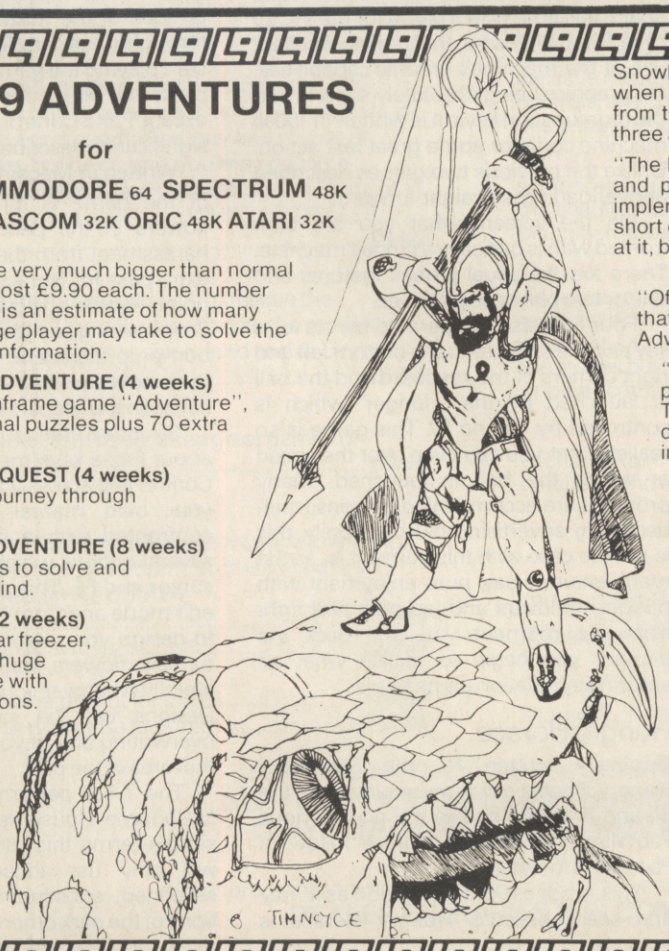
Note: a lot of players take much longer than the times above. Don't be discouraged if you are one of them!



Snowball was too new to have been reviewed when this ad. was placed, but here is a sample from the superb independent reviews of our first three adventures:

"The Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Cave is nothing short of brilliant; rush out and buy it. While you're at it, buy their others too. Simply smashing!"
–SOFT, September 83

"Of the programs reviewed here, the only one that is wholly admirable is Level 9's Colossal Adventure." *– Your Computer, September 83*

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GAMES

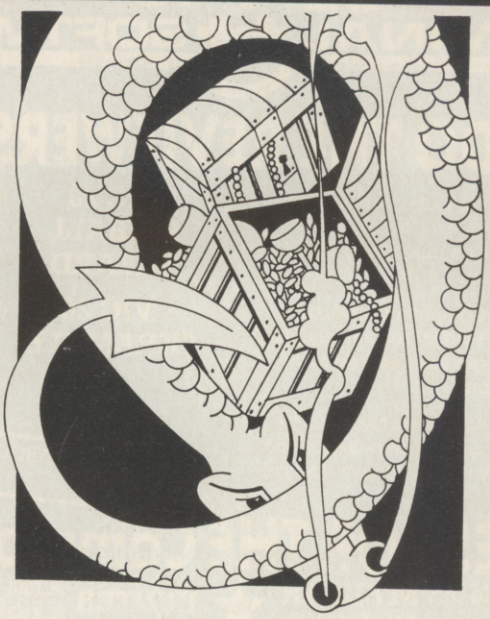
The Hobbit

The Hobbit is a new game from Melbourne House who have produced an adventure masterpiece with the help of the Tolkien Estate.

The screen is split up into two parts – the upper half is the adventure window and the lower half is the instruction window. All of the action takes place in the fantasy land of Tolkien's classic masterpiece (the special pack includes the book) and includes all the characters like Bilbo Baggins, Gandalf, Elrond and Thorin and many unfriendly beasts such as Goblins.

The mission is to seek out the evil Dragon and capture his hoard of treasure.

As soon as you enter any location, you will be given a full description of that place and exactly what is there. Communication with the computer is incredibly versatile because Melbourne House have built in a program called 'Inglish' which they claim to be the most 'sophisticated natural language recognition program yet developed on any microcomputer'.

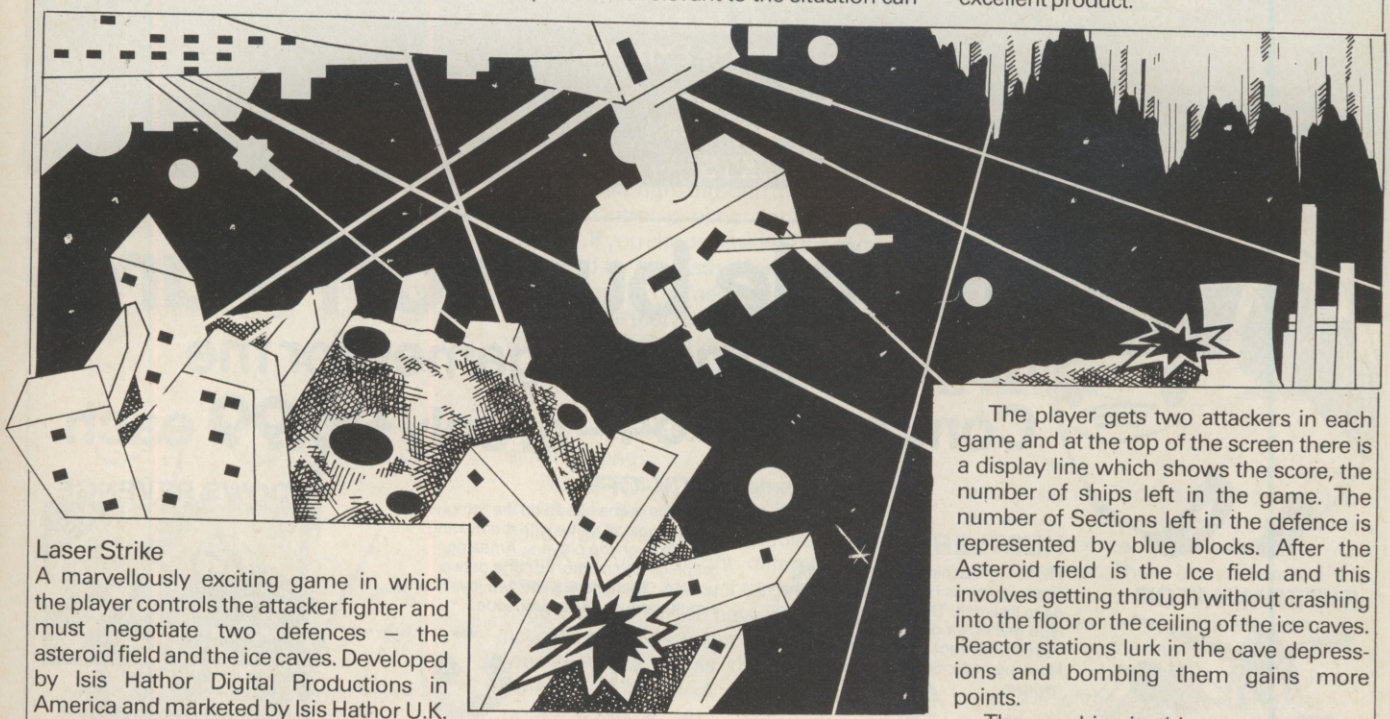


This is not a wild claim, because almost any sentence relevant to the situation can be typed in as long as it corresponds to the range of accepted commands. For example you could say 'drink beer', 'drink foaming beer', or even 'drink foaming delicious beer'.

There are several other ingenious commands available which would fill another magazine, but perhaps one of the more unusual commands is the print command which sends the contents of the adventure window to the printer as well as the screen.

Wonderful as this game may seem, it is so huge that if you get lost you could be taking a futile wander through a maze and the tedium of this may be very off-putting. Also, Melbourne House say that due to the immense size of the program they cannot guarantee that it is completely free of errors although a lot of time has been spent ensuring that the program behaves as well as it should.

However, we could not find any bugs and conclude that this is very much like Melbourne House's 'Hungry Horace' – an excellent product.



Laser Strike

A marvellously exciting game in which the player controls the attacker fighter and must negotiate two defences – the asteroid field and the ice caves. Developed by Isis Hathor Digital Productions in America and marketed by Isis Hathor U.K. this enthralling game comes on disk and on cassette and requires a 1541 and a joystick.

The ship can be moved up, down and forward by moving the joystick up, down and left respectively and is very sensitive to the joysticks movements. Moving the stick to the right releases bombs and pressing the button fires a shot from the laser cannon. Once the game is loaded, the game can be started by pressing the F7 key and the fighter appears on the left of the screen. If the ship crashes before the landscape starts, the program comes to an abrupt halt and has to be reloaded to start it again. Brown Asteroids and Asteroid cities pass across the screen and must be avoided.

Electrical fields cut across the screen and any contact with these, causes immediate electrocution. If a fighter is hit it slowly sinks to the floor and the crash causes a spectacular explosion. Points are gained by bombing the towers in the purple cities on the landscape and those on the Asteroids fetch 100 points.

The player gets two attackers in each game and at the top of the screen there is a display line which shows the score, the number of ships left in the game. The number of Sections left in the defence is represented by blue blocks. After the Asteroid field is the Ice field and this involves getting through without crashing into the floor or the ceiling of the ice caves. Reactor stations lurk in the cave depressions and bombing them gains more points.

The graphics in this game really are very realistic and it isn't difficult to imagine that the landscape, asteroids and ice caves really are what they are meant to be and not just lumps of colour with names. The sound effects are very good and help the adrenalin keep going. Laser strike really is a most professional game, well thought out and compulsive playing.

Contact: Isis Hathor U.K. Address: Andrew Barrow, Royden, Perkslane, Prestwood, Gt Missenden, Bucks HP16 0JD. Telephone: 02406 3224. Cost: Cassette: £7.50. Disk: £19.95.

TERMINAL SOFTWARE

WHAT DO THE REVIEWERS SAY?

Commodore 64 SUPER SKRAMBLE! Computer & Video Games (Sept '83) said "an excellent game." Personal Computer News (15-21 Sept '83) rated it 19 out of 20!

Commodore 64 SUPER DOGFIGHT Personal Computer Games (Dec '83) said "I would recommend it as a very compulsive and rare two-player game."

Commodore 64 SUPER GRIDDER Personal Computer News (22-28 Sept '83) said "a compelling piece of frivolity that could give hours of fun."

VIC 20 PINBALL WIZARD Personal Computer Games (Dec '83) said "this is as good as you will get."

VIC 20 SKRAMBLE! Computer & Video Games (March '83) said "a miracle of memory conservation...a thrilling and addictive game."

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Bewitched

We kick off with several games for the VIC, the first one from Imagine.

Their game is called Bewitched and it certainly is that. It is also frustrating and very good – a fine example of a game written by an amateur programmer and snapped up by a software house who clearly recognise good quality game material.

Besides the micro, you also need a cassette recorder and a monitor. It does not matter whether the monitor is colour or black and white although for purposes of clarity the colour is best because the object of the game is to navigate your way through a maze by opening coloured doors with the correctly coloured key.

On loading the game, you may think you have stumbled across some ancient Egyptian documents because of the strange characters that first appear. You will be glad to know that you haven't because the author says this is a normal part of the loading process.

The first screen is a maze that is split into three levels by doors and walls and your task is to pass through one of the different colour keys and move down to the corresponding keyhole and open it. Having done this, you will be faced with a blank space or a wall. If you get the latter that means you have to start all over again.

Once you get to the bottom of the screen the whole thing scrolls and the next section is revealed. This game is not as easy as it sounds because there are several horrible little ghosts floating around that like to devour you (although if you are lucky there are occasions when you can walk right through them).

The control is either by keyboard or joystick. If you choose the keyboard do not be fooled by the instruction which says to go up press P. The necessary key is in fact Q. Do not let that restrain you from buying what is otherwise a worthy game.

Kwazy Kwaks

Kwazy Kwaks is the next game for evaluation from Mr Chip Software and the idea here is quite simple. It is a shoot-them-while-you-can game and is a variation of the shooting alley often found at fair grounds.

The object of the game is to shoot down all the objects in the shooting gallery, and these objects move across the screen at up to eight different speeds. There are three rows of targets like ducks, owls etc. all of which have different points according to which level they are on. The top row is six points, the second is four points and the final row is worth two points.

There are two main constraints to how many points you can score. The first is time and the second is the number of bullets left. There are several levels to this game and at the end of each screen you will be given up to eight points for each bullet you have left plus the value of the timer.

Control is either through the keyboard or by a joystick and, like Bewitched, the loading procedure is out of the ordinary. You have to wait for the picture to come into focus.

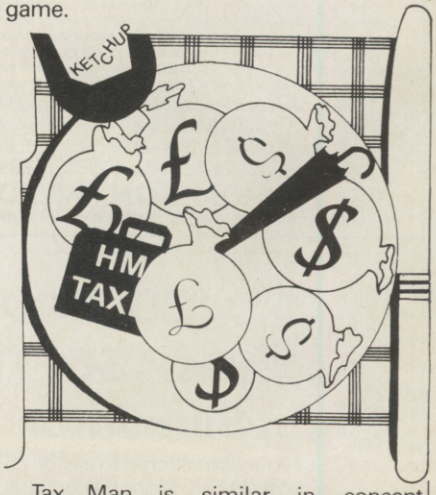
Super Copter is a flight simulation game controlled by the use of the keyboard. The mission is to fly to an enemy island and defuse a nuclear warhead.

There are several screens which can be viewed at the touch of a button.

There is a view of the cockpit which enables the player to see all the necessary equipment and information relating to the aircraft like revs per minute, altitude and rockets available.

The second screen is a radar map of the flight path which includes detailed geography of the island. The disadvantage in using this screen is that the player cannot control the supercopter and quick reflexes may be needed to avoid mountains and enemy missiles. The final screen is an actual view of the enemy island and the pilot has to land the helicopter on the pad to successfully complete the mission.

There are nine levels of play to this game.



Tax Man is similar in concept and design to Pac Man. The player has to eat up as much money as possible and avoid the tax men who are trying to make you bankrupt. There are six levels of play to this game as well as the possibility of eating the tax men and thus gaining more money. The game can be controlled by the keyboard or by using a joystick in port one. Both of these games cost £5.95.

Mandatta are a new company and they are accompanying their games with a free entry to a prize draw, the winner of which will receive a disk drive and printer. Mandatta's intentions are to produce software solely for the 64 and, although they are still looking for games programmers, they are hoping that their products will be distributed on a world wide scale in 1984. Distribution is currently performed by themselves on a mail order basis. Their address in the UK is 38 Cuddington Avenue, Worcester Park, Surrey KT4 7DB. Telephone: 01-337 0806.

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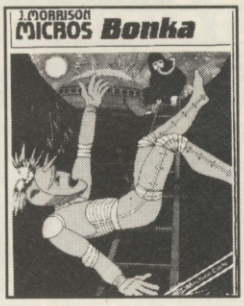

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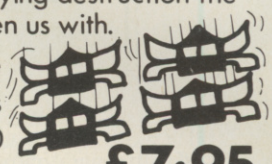

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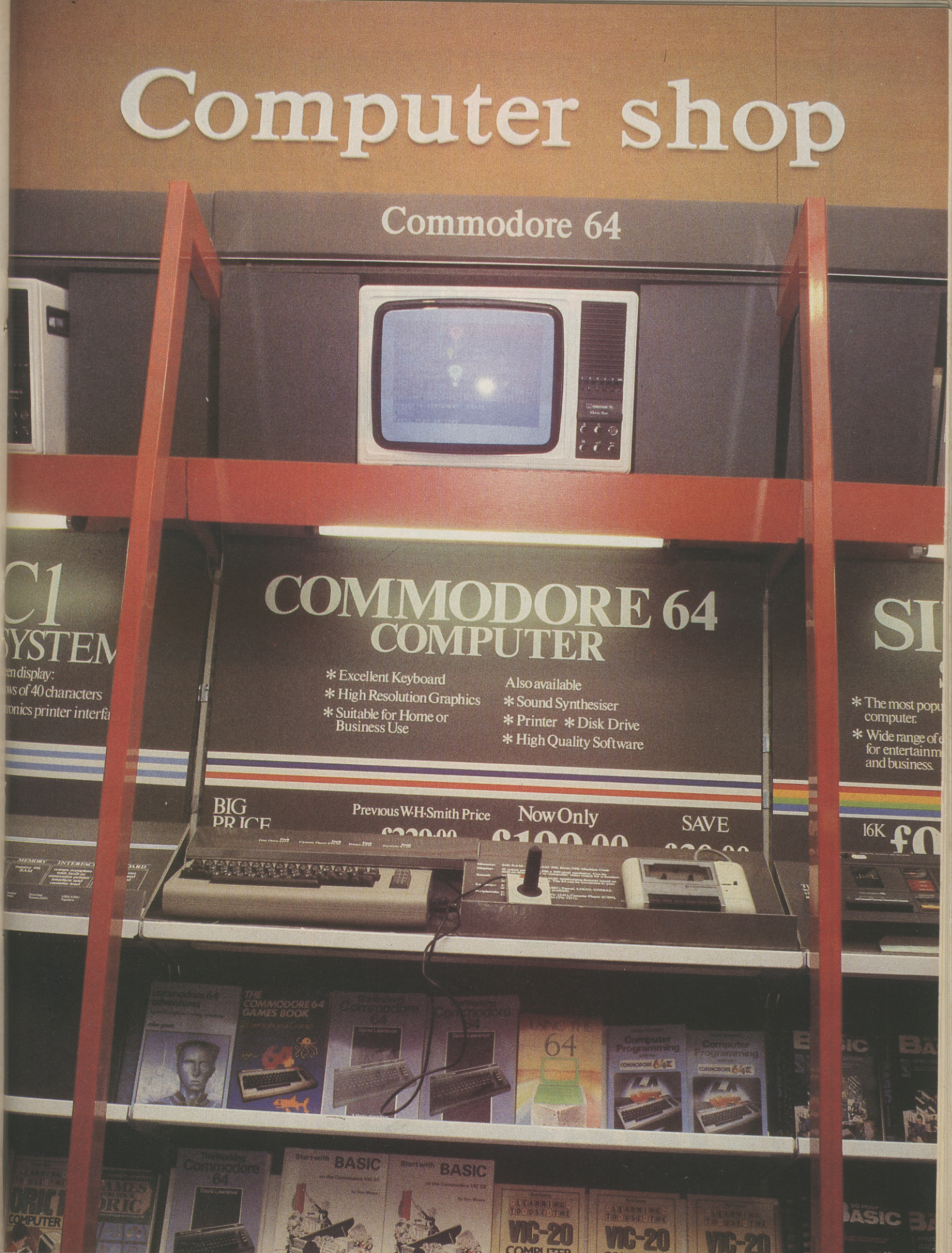

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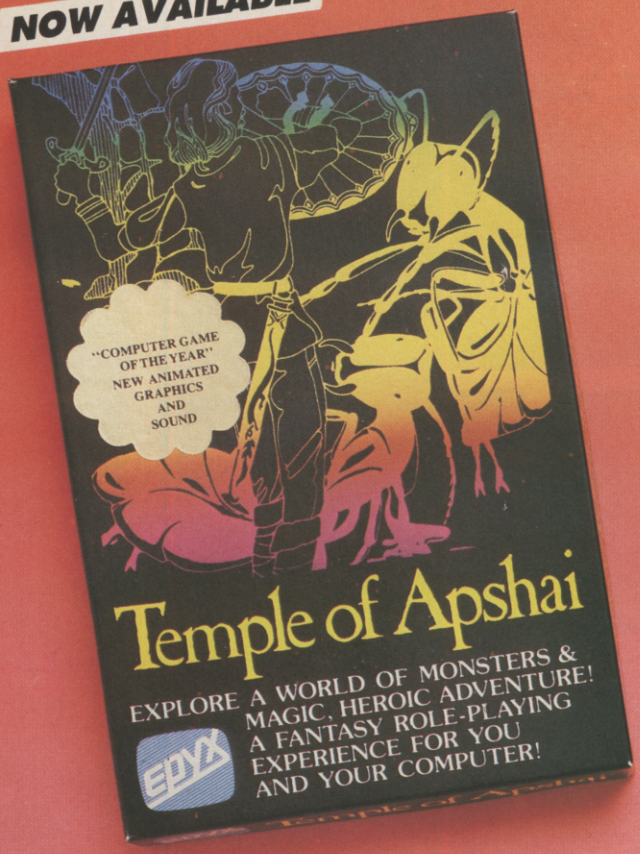

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A micro for Christmas

Whether you are looking for a computer as a gift or have decided that you deserve to treat yourself to one you'll find yourself spoilt for choice. What should you look for in a home computer? And what have Commodore's two popular machines – the VIC-20 and CBM-64 – got to offer?

Today the shops are full of home computers all with new names and attractive features. All are heavily promoted giving the distinct impression that they are the only choice. But this large number of home computers really doesn't help the first time buyer. Instead it creates confusion, so that the final choice is made even more difficult. Let's take a close look at the reasons why people buy a home computer and the ways they can help you and your family.

Computers can help a family, in recreation from the wide range of games on the market to knowledge contests like Mastermind. As computers are used extensively in schools, having one in the home complements the knowledge that your children have learnt at school. On a more serious note this same home computer can help learn a foreign language, to organise information – from recipes to video cassette collections, and even lend a hand in business.

So the actual use of the home computer is up to the buyer and the most important feature isn't in the specification at all. It lies with the choice of programs and without a large choice, a highly promoted brand won't really help you.

Out of the large number of home computers on the market how do you select the best one in the price range from around £100 to £200 plus?

The programs

Most home computers use cassettes for their programs. They take quite a long time to load into the computer, but have the distinct advantage of being low in price. To increase the speed of loading a program some home computers use a plug-in cartridge. They are more expensive than cassettes, but have the advantage of almost instant loading and the facility of being available with more sophisticated programs. The most versatile way of storing programs is by using a floppy disk, which looks just like a 45 r.p.m. record. However, disk drives are more expensive but well worth it, if you need to store lots of information and find it fast.

The keyboard

Most low priced computers have one main fault which is accepted by the user because of the amount they have spent. Its the price of paying £100 – £150 for a home computer. These machines which have a keyboard that may have the same layout as a typewriter but certainly don't feel like one. In fact if you want to use the keyboard like a conventional typewriter for word-processing, its difficult, to put it mildly. Any keyboard should look and feel just like a typewriter and also have special function keys which are needed with the more sophisticated programs.

Your television set

Any worthwhile home computer should be usable with any average domestic colour television. There shouldn't be a significant difference in the colour quality between different brands of TV. Using the computer should be as simple as unplugging the aerial and just replacing it with the lead from your home computer.

Many people are put off buying a home computer, because they think that you must learn a new foreign language called BASIC. While you can learn a language if you like, there are other alternatives.

Buy your programs off the shelf, there should be a wide range for your chosen micro, or write them yourself. Yes, there is even a program which can write a computer program for you without learning a foreign language. Its called a program generator.

Which brand?

Out of all the brands on the market, why choose Commodore? Because only Commodore can answer all the points we have made in this introduction with a positive YES. Not soon, in the near future, or will be,but NOW. And with news of some micro manufacturers just shutting up shop, then you need to be sure of the future for your chosen home computer.

Commodore have two models in the £100 to over £200 price range. The Vic=20, lowest priced model of the range has sold

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For users of the CBM/PET 3000, 4000 or 8000 series of computers who want to upgrade to new generation standards, computer specialists J.R.& S. Purdue have developed the PETX2 add-in board. Manufactured to the most exacting standards, PETX2 uses the latest microprocessor technology to double the processing speed of your CBM system, whether running BASIC, Silicon Office, Viscalc or any other application. The system comprises one board positioned inside the computer which can be fitted in 10 minutes using only a screwdriver. The board provides 96K of memory, thus upgrading 32K systems to 96K and replacing current 96K versions. This development means that your investment in software and data is protected, for by enhancing your machine speed, it comes into line with the Sirius, Osborne and even some 16-bit machines, as can be seen from the table of Personal Computer World Benchmarks.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Average
CBM with PETX2	0.87	5.1	9.4	10.3	11.2	16.5	26.0	6.0	17.5
IBM PC	1.5	5.2	12.1	12.6	13.6	23.5	37.4	3.5	17.6
Osborne 01	1.4	4.4	11.7	11.6	12.4	21.9	34.9	6.1	19.9
Apple III	1.7	7.2	13.6	14.5	16.0	27.0	42.5	7.5	24.7
ACT Sirius 1	2.0	7.4	17.0	17.6	19.8	35.4	55.9	4.1	24.5
Apple 2	1.3	8.5	16.0	17.8	19.1	28.6	44.8	10.2	30.4
Commodore CBM 8032	1.7	10.0	18.4	20.3	21.9	32.4	51.0	11.9	34.3

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over 2 million worldwide and over 170,000 here in the UK. At the top end of this market their Commodore 64 has sold over 90,000 in just six months, so by Christmas this year will be in six figures too. In fact current figures give Commodore 35=40% of the UK home computer market.

Being brand leader on its own isn't enough, but Commodore can answer the important question of choice of programs with YES. No extra adaptors are needed to use cartridges. Their disk drive actually exists. The choice of programs is constantly increasing and ranges from the simplest game to the most sophisticated business package.

Printers and plotters

There's no substitute for seeing the information you have stored on disk or tape printed out. Equally that program just created can be easily debugged once a print-out is made. So to complement your Vic=20 or Commodore 64 you need a printer.

Preferably one produced by the computer manufacturer, so that it can work without any problems and match the needs of your home computer. If you want to print out shapes and drawings produced by a graphics package, then a plotter can be very useful.

Commodore produce two printers for use with the Vic=20 and C64. Their dot matrix printer 1525 works at 30 characters per second and costs around £230. While the Model 1526, another dot matrix unit, works twice as fast, 60 characters per seconds and costs £345. The plotter available for both machines costs just £169.99 and is quite remarkable value. It prints graphs and histograms in four colours, plus characters and numbers at 14 characters per second.

Programming

Commodore produce a range of programs to ease you into writing your own programs, so it can be easier than you thought.

If you don't want to learn, buy programs for a specific interest, be it word-processing, education, pure home use, games, thinking games or business use. And if writing your own programs appeals, but not learning a language like Basic, try Codewriter for the Commodore 64. It will generate a program for you in English.

Conclusion

Even though there have been lots of new strange names appearing on the home computer scene in the last twelve months, you'll have a difficult job finding better value than the Vic=20 and Commodore 64. Unlike their competition they are available now, plus their wide range of peripherals and accessories, so a complete system can be bought for Christmas.

Commodore 64

Looking remarkably like the Vic=20, the Commodore 64 can be considered to be its big brother. The main and most significant difference lies in the amount of RAM – Random Access Memory.

With the Commodore 64, this is 64K, the same amount fitted to far more expensive computers costing three and four times as much. As a result the Commodore 64 can be used with far more sophisticated programs than the Vic=20.

This makes it more suitable for use with a small business, as the programs and datafiles need more space. In fact there is also a program available for the Commodore 64, which lets you write a program without bothering to learn Basic.

With a list price of around £230, the Commodore 64 offers a combination of the highest amount of RAM plus by far the best keyboard in its class. Like the Vic=20 accepts programs on cassettes, in cartridge form or using the optional floppy disk drive.

Vic=20

The Vic=20 is the lowest priced of the Commodore home computer range and is being currently sold as a starter kit around £150. Shopping around will bring this price down to around £135. The computer can also be bought on its own for around £100.

The Vic=20 has 5K of memory as standard, however this can be easily extended up to 19.5K with one of a range of memory expansion units. The screen of your television will display a 32 character display and the keyboard is just like a conventional typewriter, plus a set of special function keys. Excellent sound and sound facilities complete the specification.

Users of the Vic=20 have a choice of cassette or cartridge loading programs. There is a disk drive unit available for use with more serious and sophisticated programs.

The Vic starter kit comprises the computer, special cassette unit, introduction to Basic and four programs. So its ready to use as soon as the lead is plugged into your domestic TV set.

Joysticks

J7
The J7 joystick from Flight Link Control is compatible with the VIC 20. Coming in a compact case, the joystick uses four microswitches to give exact and rapid control of those fast moving games. Available from local dealers or Flight Link Control Limited, Unit 12, The Maltings, Turk Street, Alton, Hants. 0420 87241.

Joystick
This joystick from Commodore can be used to play the arcade-type games for the CBM 64 and when used with high resolution graphics can draw pictures and help with graphic plotting. £7.50. Available from Vicsoft. Telephone: 0753 73638.

Redball Joystick
An arcade type joystick with a red ball handle that can move into 8 standard positions. It has two fire buttons on the base and one on the top of the handle. A slide button enables the user to select a fire button. Comes with a 5 foot long cord. £27.95. From Silica Shop Ltd, Dept. ZPCW 0883, 1-4 The Mews, Hatherley Road, Sidcup, Kent. Telephone: 01-309 1111.

PRO-ACE
The Pro-Ace joystick is compatible with the VIC 20 and the 64. It costs £12.95 and has two fire buttons. Available from Sumlock Microwave, 198 Deansgate, Manchester Telephone: 061-834 4233.

TAC
The Suncom Totally Accurate Controller (TAC 2) joystick has an arcade style ball stick handle and two responsive fire buttons. The suggested retail price for this Commodore 64 and VIC 20 compatible joystick is £18.95. The Slik Stik joystick has one fire button and an extra long lead. The suggested retail price for this square based unit which will work with the 64 and the VIC is £9.95. Both of these joysticks are from Consumer Electronics Limited, Failsworth, Manchester M35 0HS. Telephone: 061-682 2339.

Starfighter Joystick
A sturdy joystick 3½ inches tall with a small stick. It has smooth rounded corners and a red firing button on the base. Comes with a two year guaranteed. £13.50. From Silica Shop Ltd, Dept. ZPCW 0883, 1-4 The Mews, Hatherley Road, Sidcup, Kent. Telephone: 01-309 1111.

Joy-Sensor
An electronic joystick simulator by Suncom. It is designed to replace the more conventional joystick and provides a combination between control and responsiveness. With a rapid or single fire feature and a four or eight way control to cope with action or maze games. £29.95. Details from Consumer Electronics Ltd, Failsworth, Manchester M35 0HS. Telephone: 061-682 2339.

Quickshot
A joystick with a continued grip and a positive response fire button as well as a more conventional firing button. A rubber suction cup footing is provided to help stabilise a one hand operation and it has a four foot cord. £11.95. From Vulcan Electronics Ltd. Telephone: 01-203 6366/7.

The Analogue Joystick
It is possible to write programs using this analogue joystick. It adds another dimension to the games written and it gives full joystick control in any direction even in a figure eight or in loops. £14.95. From Stack Computer Services Ltd, 290-298 Derby Road, Bootle, Liverpool.

Paddle Controllers
Two paddles moulded in black with red firing buttons at the side. £13.95. From Silica Shop Ltd, Dept. ZPCW 0883, 1-4 The Mews, Hatherley Road, Sidcup, Kent. Telephone: 01-309 1111.

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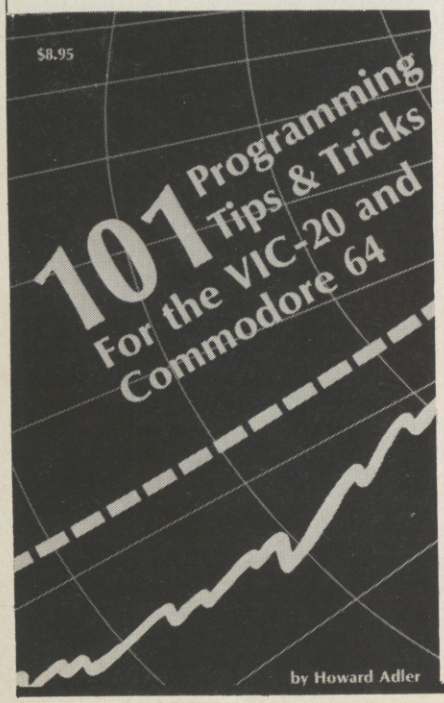
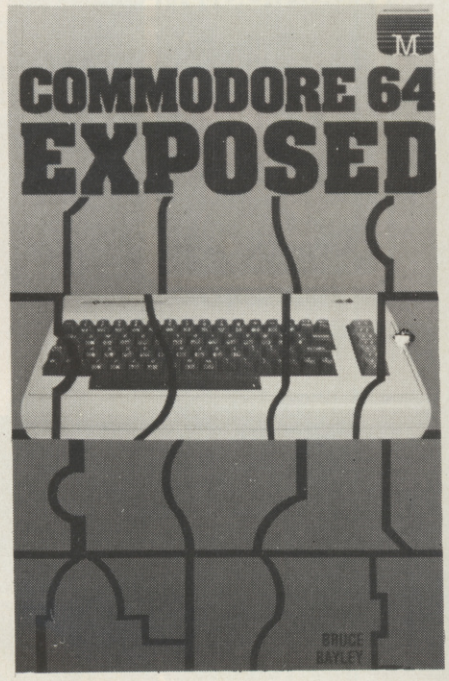
BOOKS REVIEW

'Volcanic Games for your VIC 20' costs £3.95 contains 30 games, some of which require 16K expansion. Content consist of explanations, program listings and drawings. The publishers are Addison-Wesley Publishers, 53 Bedford Square, London WC1B 3DZ telephone 01-631 1636.

'VIC 20 User Guide' attempts to explain what the user can do with the VIC 20 beginning with BASIC programming and progressing to graphics and sound. The cost is £10.95. 'Armchair BASIC' explains the difference between hardware and software, guides the reader through the fundamentals of BASIC programming and shows how a computer uses input to produce results. The cost is £9.95. The publishers of both books are Osborne-McGraw-Hill and the books are available from the Computer Bookshop, 30 Lincoln Road, Olton, Birmingham telephone 021 707 7544.

Three books and tapes for the beginner 6502/6510 assembly language programmer. There is 'Beginners Assembly Language for the PET 2, 3, 4 and 8000 as well as the VIC 20 and 64. The cost of each is £14.95 from Honeyfold Software Limited, Standfast House, Bath Place, High Street, Barnet, London telephone 01-441 4130.



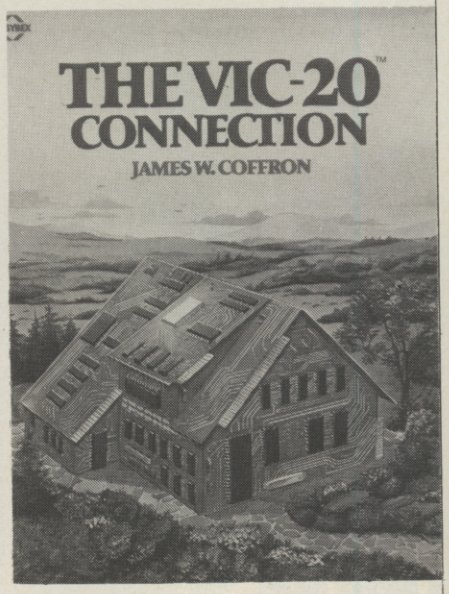


'VIC 20 Exposed' costs £6.95. Explains functions and programming variables and teaches the user how to take full advantage of the VIC 20's capabilities. 'Commodore 64 Exposed' also costs £6.95 and is an encyclopaedia of solutions from BASIC programming through to machine language. Both books are available from Melbourne House Publishers Limited, Melbourne House, Church Yard, Tring, Hertfordshire HP23 5LU. 'The VIC 20 Connection' shows the user how easy it is to use the micro in conjunction with household devices. This book is published by Sybex and is available from The Computer Bookshop, 30 Lincoln Road, Olton, Birmingham telephone 021 707 7544.

'VIC 20 Computer Program Writing Workbook' cost £4.25. A reference guide to BASIC and graphics, the book also contains 80 forms to make software writing easy. From Columbus Books, Devonshire House, 29 Elmfield Road, Bromley, Kent BR1 1LT telephone 01-290 6611.

'VIC Graphics' provides the reader with an introduction to programming techniques used to generate graphic displays. Topcis include colour, plotting, rotation and movement. The price is £6.95 from Ducksworth, The Old Piano Factory, 43 Gloucester Crescent, London NW1

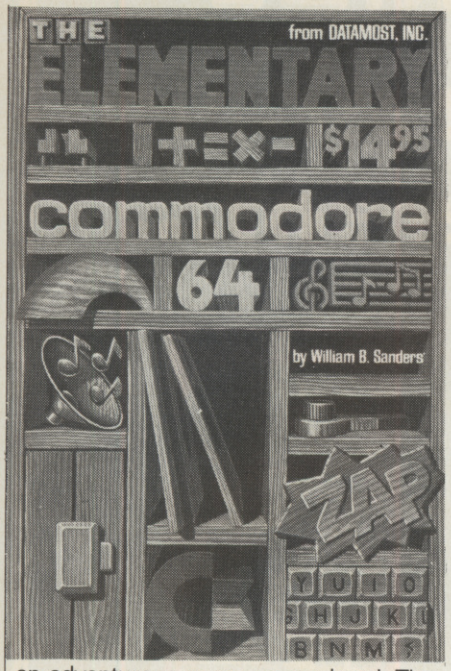
'Write Your Own Adventure Programs' includes program listing for the VIC and PET. Step-by-step guide to writing adventure games programs with expert tips. 'Practical Things to do with a Microcomputer' is aimed at the micro beginner. Programs include building a robot. 'Guide to Better BASIC' is a beginner's guide to writing programs in BASIC. All books are priced £1.99 and are published by Usborne Publishing Limited, 20 Garrick Street, London WC2E 9BJ.



Duckworths have launched a number of books about the VIC and 64 to complement *The Commodore 64 Revealed, VIC Graphics, VIC Programmes 1* and *VIC Revealed,* the prices of which start at £6.95.

Using The Commodore 64 is a complete look at the latest home computer from Commodore. This book starts with a BASIC refresher course and moves on to look at things like peripherals, chips, BASIC and M/C instruction sets and an M/C assembler/disassembler listing. Illustrated with example listings, the book costs £9.95.

Exploring Adventure Games on the 64 is designed to get the 64 user to write down their own games. Inputting information, mapping, movement, vocabulary and everything else required to write



an adventurous game are explored. The games listed in this book (which costs £6.95) are also available on cassette for £7.95.

Adventure games are also catered for in a book called *Exploring Adventure Games on the VIC* which is very similar in content to the previous book. The price if £6.95.

Commodore 64 Games contains 15 new games written specially for the machine and again the price is £6.95. *The Beginner's Guide to Computers and Computing* is written for those people who know nothing about computers. It contains a history of computing and a glossary of computing terms.

Sprites and Sound on the Commodore 64 is a guide to the 64 with working explanations of the 6581 SID chip, the 6566 Video Interface Chip and the 6510. There are sections on programming your own musical instruments and producing sprite and programmable character animation.

Next on Duckworth's list come two handbooks, one for the VIC the other for the 64 which purport to tell you all the vital information you need when using either machine.

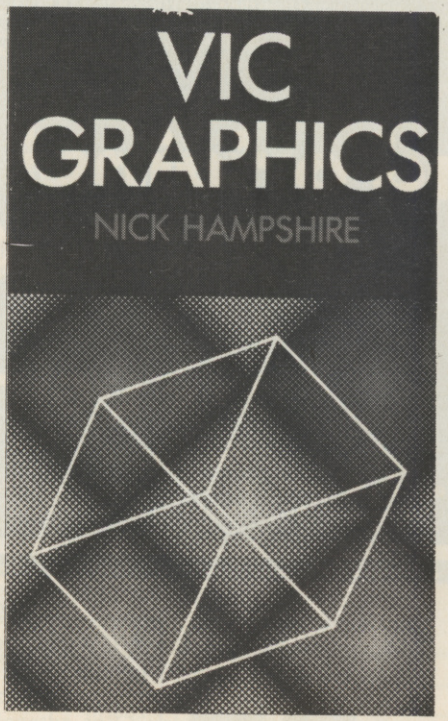
Other books from Duckworth's include *Advanced BASIC & Machine Code for the 64, Commodore 64 Graphics, Advanced BASIC & Machine Code for the VIC, Twelve Simple Electronic Projects for the VIC, VIC Games* and *Will You Still Love Me When I'm 64?*. All of these books start at £6.96.

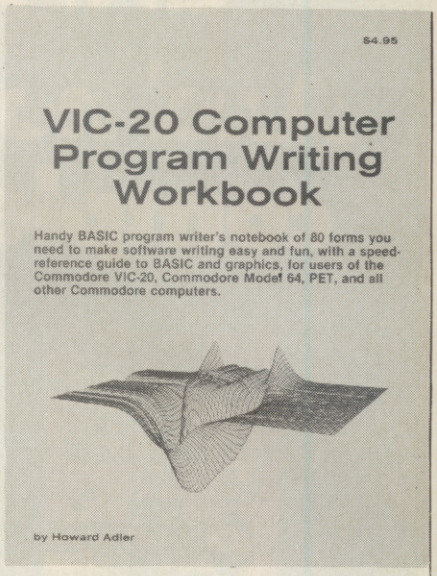
Contact: Duckworths, The Old Piano Factory, 43 Gloucester Crescent, London NW1 7DY.

'34 VIC Computer Programs for Home, School and Office' cost £7.75. All of these programs have been designed for easy and quick typing into the micro and are aimed at the beginner. '101 Programming Tips and Tricks for the VIC 20 and Commodore 64' costs £7.95. Both books are available from Elkan Electronics, 11 Bury New Road, Prestwich, Manchester M25 8JZ telephone 061 798 7613.

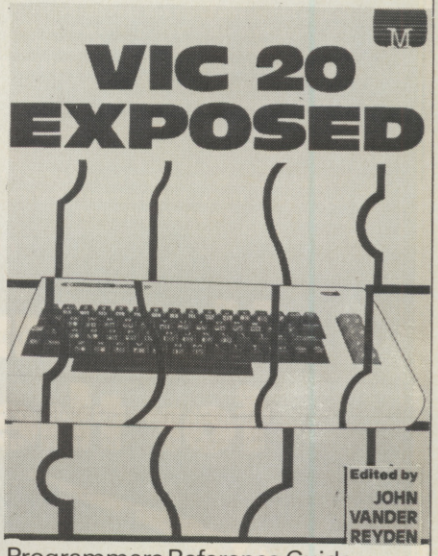
'Mastering the VIC 20' studies BASIC and VIC 20 structure and offers many programs which can be supplied separately on tape or disk. Contents also include peripherals and hi-res graphics in BASIC and Machine Code. Publishers are Ellis Horwood Limited, Market Cross House, Cooper Street, Chichester, West Sussex PO10 1EB.

'The Easy Guide to Your Commodore 64' explains how to use software and teaches the basics in programming. Practical operations include word processing, budgeting, filing and mathematical calculations along with many more. 'The Commodore 64 BASIC Hand book' is a dictionary-style handbook describing BASIC vocabulary. Short sample programs illustrate the use of each command. 'Your First VIC 20 Program' is designed for the beginner. Illustrations and diagrams enable the reader to learn enough BASIC to begin programming. All of these books are published by Sybex and are available from The Computer Bookshop, 30 Lincoln Road, Olton, Birmingham B27 6PA telephone 021 707 7544.





'The Elementary Commodore 64' teaches the reader to use and program the computer. Learn to load and save programs on cassette or disk, edit programs, create graphics and music and many other handy utilities. The cost of the book is 12 pounds and 70 pence and it is published by Prentice/Hall International, 66 Wood Lane End, Hemel Hempstead, Herts. HP2 4RG.



Programmers Reference Guide

This guide can be used by complete novices and experienced programmers. It contains aspects of both BASIC and Machine Language programming and includes tips to help use the CBM 64. Features for the beginner include a description of each BASIC command plus example programs and for the advanced programmer it has a CBM 64 memory map and a list of the KERNAL entry points. 9.95. Available on mailorder from Vicsoft. Tel: 0753 73638.

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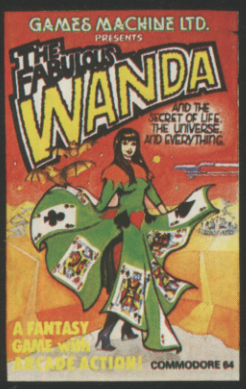

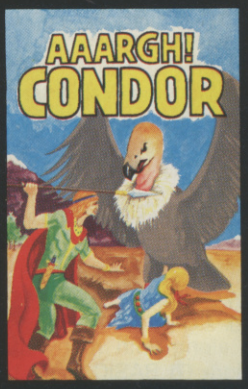

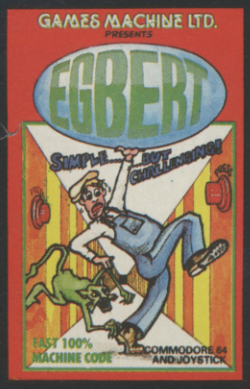

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English Language
Material provided by International Correspondence School (ICS) tutors and covers the GCE/CSE syllabus. Covers Composition, Summary, Comprehension, Spelling, Grammar and a General test. Comes on two cassettes for the CBM 64. £9.99.

Biology
Material supplied by the ICS and follows the GCE/CSE syllabus. Covers nutrition, respiration, nervous system, the circulatory system, excretion, movement, reproduction and the Biology of the Environment. Supplied on two cassettes for the CBM 64. £9.99.

Geography
Follows the GCE/CSE syllabus and covers climate, farming and rural settlement, industry and power supplies, transport and trade and population and towns in Great Britain. Various world topics are also included. Supplied on two cassettes for the CBM 64. £9.99.

Mathematics I
Tests knowledge of arithmetic, algebra, geometry and trigonometry and ends up with two tests of short and long questions. It contains a mixture of modern and traditional mathematics. Comes on two cassettes for the CBM 64. £9.99.

Mathematics II
Similar to Mathematics with ICS data. Concerned more with traditional mathematics covering arithmetic, equations, progressions, functions, calculus and trigonometry. Contained on two cassettes for the CBM 64. £9.99.

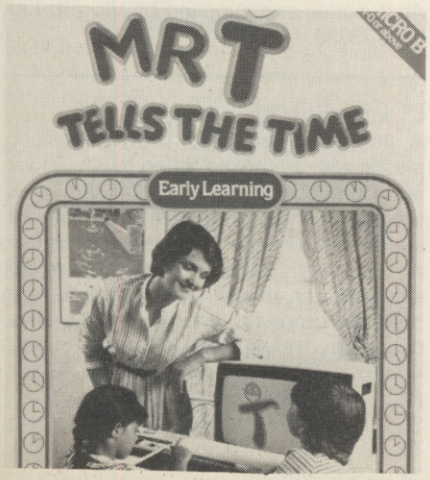
History
Follows the GCE/CSE syllabus and covers the following topics; The two World Wars, Peace and Democracy, Totalitarianism Empires and the Commonwealth, both Communist and Capitalist Bloc countries, Great power relations and Emerging nations. Contained on two cassettes for the CBM 64. £9.99.

Physics
Material gathered with help of an Educational publishers. Covers charges and circuits; electricity and magnetism; electronics and nucleonics; waves and sound light; matter; forces and motion. Comes on two cassettes for the CBM 64. £9.99.

Chemistry
Program covers Basic techniques; the Periodic tables; Structure; Binding and Energy; Redox reactions; Acids, bases and salts; Reactions and their rates; Analysis and Organic Chemistry. Comes on two cassettes for the CBM 64. £9.99.

Test and Match Series
Four packages included in this series especially for the 5-8 year olds. ARITHMETIC I shows how to do simple addition and subtraction using numbers from zero to ten. ARITHMETIC II shows how to simple multiplication and division. ALPHABET introduces the child to the lower and upper case letters and VOCABULARY helps to increase a childs word power by displaying labelled pictures of familiar objects which need a word to be entered that is associated with each part of the picture. Each one comes on cassette for the Vic 20 (8 or 16K) and costs £9.99.

Test Your Child Series
Five programs designed for children aged 8-11 in the form of tests. GENERAL KNOWLEDGE comes in the form of quizzes covering general knowledge and nine specialist topics including food, drink, history and travel. SPELLING I and II test the spelling capabilities of a child by asking child to identify incorrectly spelt text. ARITHMETIC covers addition, subtraction, multiplication, one line and long division, fractions and decimal numbers. READING tests childs literary ability. Each program comes on cassette for the Vic 20 (8 or 16k) and costs £9.99.



Program time

Educational Software
Several programs for the young child and the CBM 64. Mr T Tells The Time is made up of four separate games that will help the child to tell the time. Mr T's Shape Games enables the young child to recognise and recite names of shapes. Mr T's Measuring Games helps the child observe, compare and understand lengths and heights. Mr T's Money Box helps your child understand the intricacies of our coinage system. Mr T's Alphabet Games lets the children practice their alphabet and Mr T's Number Games helps the child to learn to count the numbers one to nine. All of these cost £12.95 each and are available from Ebury Software, 72 Broadwick Street, London W1V 2BP. Telephone: 01-439 7144.

Keeping it tidy

Trays, cases, cabinets, files, boxes ... there's a huge range of accessories which are useful and attractive – two necessary qualities for the ideal gift. We've taken a lucky dip into what's available ...

Disk Pack Carrying Case

A black foam rubber lined transport case for disk packs and disk cartridges. The outer casing is made of robust plastic and has double locks. Three removable cushions provide secure packing and can hold three cartridges or one disk pack. £90.73. From Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon.

Tape Carrying Case

A black robust plastic transport case for magnetic tapes. It is lockable and has removable partitions and label holders. Has a capacity of six magnetic tapes. £59.50. From Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon.

Compucolor

A marking system based on digit and colour combinations for racking. Useful in any library system and supplied in sets of 1000. Each set contains labels for marking the reel, the case and the racking. £88.00. From Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon.

Cassette Carrying Case

Two cases made of tough washable black plastic with individual divisions for the cassettes. One holds 16 cassettes at £3.25 and one that holds 32 cassettes at £4.99. Available on mail order from Vicsoft. Telephone. 0753 73638.

Antler Hard Case

Designed to carry six tapes with space for the computer, tape machine and a compartment for plugs, leads, transformer and a modulator. The computer can be used from within the case. Moulded in black a.b.s. plastic with a cushion grip handle and a blue brush nylon surface inside. £42.50. By Antler Specialist Cases Division available on mail order from Vicsoft. Telephone: 0753 73638.

Handy and portable disk storage from Inmac.

Floppy Manager

An interlocking storage system with modules that interlock for either the 5¼ or 8 inch diskettes. Each case holds up to ten diskettes in a dust free environment and can be stocked together on a bookshelf, in a file drawer or on a desk. For access a tray automatically flips forward when the storage system is opened. Made of beige coloured polystyrene. The 5¼ inch: 6.50 and the 8 inch: 6.75.Available from Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Diskmate

A floppy disk filing system. A dark brown plastic case with a smoked, hinged lockable lid. 80 sets of suspension clips hold the 5¼ inch floppy envelopes and once the retaining bars are closed the disks cannot fall out. It comes with 20 wordprocessing and 20 data processing cards which enable the user to record details about the diskette contents. 37.00. Available from Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Floppy Disc Media Storage

A data storage binder supplied with one panel for the storage of ten 5½ inch. floppy disks. Also contained are ten dividers for the filing of hard copies and ten plastic pockets for the storage of program instructions. Folds flat like an ordinary binder £9.99. Made by Esselte Accessories and supplied by Vicsoft. Tel: 0753 73638.

Diskette Storage Box

A storage box made of brown antistatic plastic with a smoked tinted cover. A lock is moulded into the box and the lid is hinged so that it remains open without support or can be removed completely and the tray stacked inside. Boxes are available for the 5¼ inch and 8 inch diskettes and for the two alternative capacities, 40 or 80 diskettes. Cost: 40×5¼: £16.25, 80×5¼: £23.00, 40×8: £22.25, and 80×8: £29.50. Available from Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon. Tel: 0793 37837.

CHRISTMAS GIFTS

Transport Case
A case with space for carrying thirty 5¼ inch disk. A very strong green case of glass reinforced polyester with a numbered lock. Each of the six floppy drawers has spacers designed to accept five floppy disks. Three drawers can be removed to make room for other items. 34.00. Available from Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

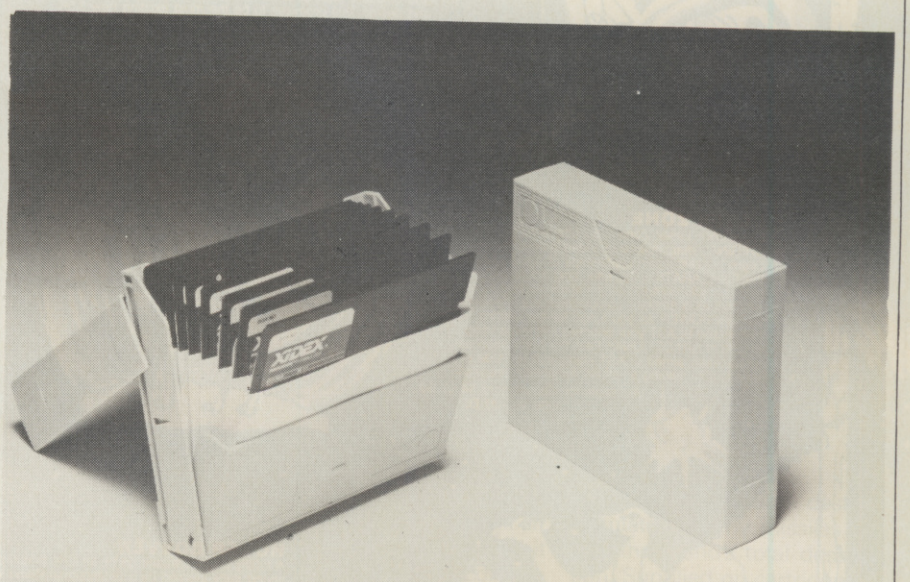
Mini Cartridge Leaf and Binder
The DC 100 A cartridges can be stored in a white plastic leaf capable of holding 6 mini data cartridges. Each one is secured by a moulded dimple and this leaf clips into the triple D-ring binder for neat storage. 7.50. Available from Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Cassette File
Made of reinforced plastic, this file has space for storing cassettes in 18 protective cells. The tray is slanting at an angle and the file is protected from contaminants by a sleek, smoke-tinted top. 33.00. Supplied by Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Mini Data Cartridge Tray
A tray capable of storing up to 24 mini-cartridges. It has a smoked transplarent acrylic top which tilts open with slanted plastic storage shelves. One year guarantee. 29.00. Supplied by Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Diskette Storage System
A red easel ring binder which can hold up to 10 frames of vinyl pockets with space for 5 diskettes in each frame. It can be folded back to form an easel effect £12.95. Available from Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon. Tel: 0793 37837.

Conquest Soft Case
A light weight compact carrying case which can transport the CBM 64 computer, a C2N cassette drive and a power pack in the lower part of the case. Software can be kept in the flap. £15.95. By Conquest and available on mail order from Vicsoft. Telephone: 0753 73638.



Diskette Storage Boxes
The SEE 10 box stores 10 floppy disks enabling the user to remove disks without damaging the others. The box stores 5¼ inch disks and is available from BFI Electronics Limited, 516 Walton Road, West Molesey, Surrey KT8 0QF. Telephone: 01-941 4066.

3-Drawer Cassette Storage Cabinet
A cabinet with a capacity for 36 cassettes that can be stored away in three drawers. Several cabinets can be stored if required. Has a woodgrain finish. £9.99. Made by Cambra and available from Vicsoft. Tel: 0753 73638.

Cassette Storage Cabinet
A study unit with a woodgrain finish and a hinged smoky perspex lid. Holds 33 cassettes in individual dividers £8.49. Made by Cambra and available from Vicsoft. Tel: 0753 73638.

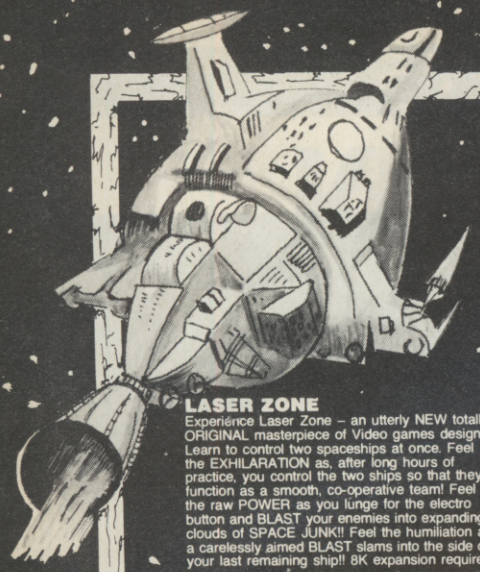
Library Case
A beige polystyrene case for the storage of floppy disks – 5 and ¼ or 8 inch, with a pop up feature to put them in full view. Tabs and tab insets are provided for labelling and identification purposes. 5¼ inch minifloppy disk: 3.50 and 8 inch disk: 4.50. Available from Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. tel: 09285 67551.

Pop Cassette Carrying Case
A carrying case for up to 36 cassettes made in a tough plastic. Available in bright colours e.g. green and yellow £3.50. Made by Cambra and supplied by Vicsoft. Tel: 0753 73638.

Cassettes
Blank data cassettes costing £5.95 are suitable for use in all popular home computers. Free library case with every cassette. From Startech, 208 Aigburth Road, Aigburth, Liverpool L17. Telephone: 051-727 7267.

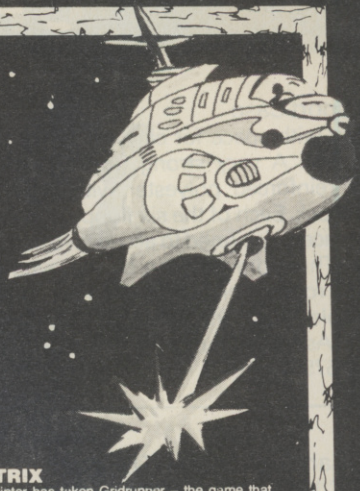
Filing Tray
A yellow tray which can hold up to one hundred 8 inch diskettes. Divided into five separate compartments. 8.50. Avialable from Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon. Tel: 0793 37837.

Diskette Desk Stand
For either 5¼ or 8 inch diskettes, up to 30 diskettes can be stored in this stand. They are stored in transparent vinyl pockets which makes the identification of the diskettes simpler. Colour labels are supplied. 5¼ inch: £34.00 and 8 inch: £38.00. Available from Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon. Tel: 0793 37837.



METAGALACTIC LLAMAS BATTLE AT THE EDGE OF TIME

A fast and original game for the unexpanded VIC. Challenging and colourful, with good sonics and a unique game action and design, this promises to be the most exciting new 3.5K VIC game since the introduction of GRIDRUNNER nearly a year ago. **£5.50**



LASER ZONE

Experience Laser Zone – an utterly NEW totally ORIGINAL masterpiece of Video games design. Learn to control two spaceships at once. Feel the EXHILARATION as, after long hours of practice, you control the two ships so that they function as a smooth, co-operative team! Feel the raw POWER as you lunge for the electro button and BLAST your enemies into expanding clouds of SPACE JUNK!! Feel the humiliation as a carelessly aimed BLAST slams into the side of your last remaining ship!! 8K expansion required.

Available for Commodore 64 **£7.50** and VIC-20 **£6.**

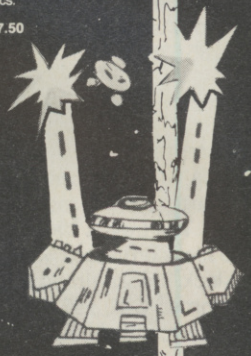
MATRIX

Jeff Minter has taken Gridrunner – the game that topped bestseller charts in USA and UK – and created an awesome sequel.
Graphically superb, it features multiple screens, new aliens and attack waves, mystery bonuses, renegade humanoids, deflexor fields, diagonal tracking, countdown/panic phase and much, much more...
Packed into 20 mind-zapping zones and accompanied by incredible sonics.
8K expansion required.
Available for Commodore 64 **£7.50** and VIC-20 **£6.**

HOVER BOVVER

A totally original arcade game for C64 featuring outstanding graphics and a sound track created by a professional Piano Wizard. Gordon Bennet has borrowed his neighbour's Air-Mo lawnmower. Mow your way through as many of the 16 lawns as you can before the pursuing neighbour retrieves his mower. Set your dog onto the neighbour to help you out of tight spots and don't annoy the gardener. Try not to plough through the neat flower beds or overheat your mower!

£7.50

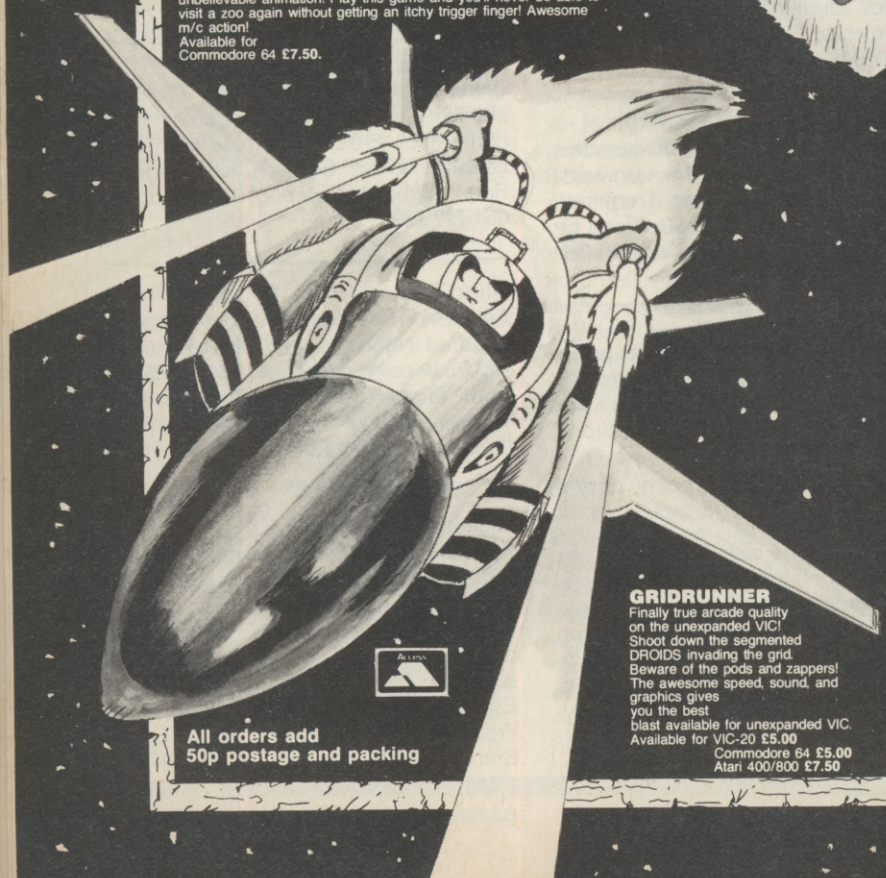


ATTACK of the MUTANT CAMELS

Planet earth needs you! Hostile aliens have used genetic engineering to mutate camels from normally harmless beasts into 90 foot high, neutronium shielded, laser-spitting death camels!! Can you fly your tiny, manoeuvrable fighter over the mountainous landscape to weaken and destroy the camels before they invade the humans stronghold! You must withstand withering laser fire and alien UFOs. Game action stretches over 10 screen lengths and features superb scrolling, scanner 1/2 player actions and unbelievable animation! Play this game and you'll never be able to visit a zoo again without getting an itchy trigger finger! Awesome m/c action!
Available for Commodore 64 **£7.50.**

ABDUCTOR

A classic new space game! ZAP the swirling alien hordes before they ram you – and abduct your humanoids! Survive the assault for long enough and you'll get an extra stage on your spaceship with double firepower! Awesome unexpanded VIC Action. **£5.00**



GRIDRUNNER

Finally true arcade quality on the unexpanded VIC! Shoot down the segmented DROIDS invading the grid. Beware of the pods and zappers! The awesome speed, sound, and graphics gives you the best blast available for unexpanded VIC.
Available for VIC-20 **£5.00**
Commodore 64 **£5.00**
Atari 400/800 **£7.50**

llamasoft

AWESOME GAMES SOFTWARE

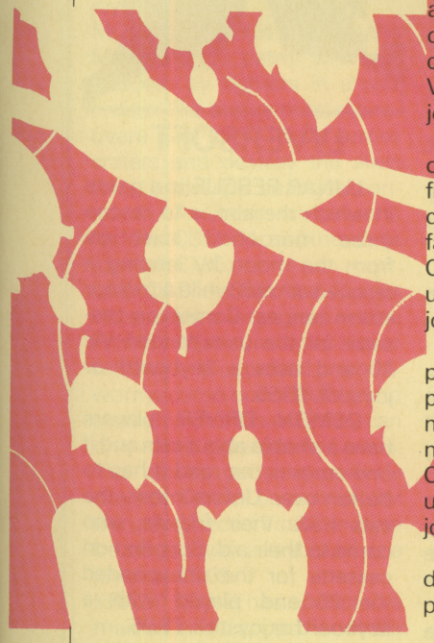
49 MOUNT PLEASANT,
TADLEY, HANTS. RG26 6BN.
TELEPHONE: TADLEY (07356) 4478

All orders add 50p postage and packing

GAMES GALORE!

GALACTIC SOFTWARE

BUG DRIVER – the beetle has to outswim the merciless bug eating fish while trying to steal their eggs. Available on cassette for the CBM 64 or the Vic 20 and used with either a keyboard or a joystick. £5.50.



FROGGY – the frogs have to cross a road and avoid trucks and cars. Then the river must be traversed with its boats, logs, turtles and lilyponds. Comes on cassette for the Vic 20 and the CBM 64 and played with a keyboard or joystick. £5.50.

ROBOT MOUSE must collect atomic cheese from the floor of a space maze. Malfunctioning robots try to prevent the mouse's progress. Supplied on cassette for the unexpanded Vic 20 and uses a keyboard or joystick. £5.50.

NEUTRON ZAPPER – the player must pilot a space ship through the galaxy and survival against the dangers depend on fast reflexes. Available on cassette for the unexpanded Vic 20 and uses a keyboard or joystick.

3D-MAZE is a game based on using wits as the player finds a way through the three dimensional maze. A time factor is an added difficulty. Comes on cassette for the unexpanded Vic 20 and uses a joystick or keyboard. £5.50.

SPACE SHUTTLE – the player must rescue psychopathic scientists from the moon. Hazardous space fragments provide a challenge. Comes on cassette for the unexpanded Vic 20 and uses a joystick or keyboard. £5.50.

Commodore have produced two games for business people.

LOBSTER CATCHER – a business game where the player is owner of a lobster fishing fleet and must anticipate good and bad weather conditions in deciding the best situation to lay heavy or light weight pots. Decisions are important. Available on cassette for the CBM 64 and needs a keyboard. £11.99.

HIGH FLYER is where the player is managing a small air company and must expand it into a multi-million concern using business acumen. Decisions must be made with airline schedules, the type of aircraft to be used for the most profits, borrowing money etc. Comes on disk for the CBM 64. £11.99.

Thorn EMI have released a series of wargames for the Vic 20.

TANK COMMANDER. The player's mission is to drive a single tank over enemy lines and blow their supply dumps up. Rough roads and ambushing enemy tanks are a threat. One or two players can participate. Available on cartridge for the Vic 20 (3k) and either a keyboard or joystick can be used. £29.95.

MINE MADNESS. Gold has been discovered in an abandoned mine and players must get it to the surface by moody elevators. Mine monsters and rock falls and a mysterious force contribute to the difficulties. One or two players. Supplied on cartridge for the Vic 20 (3k) and used with a joystick or a keyboard. £19.95.

COMPUTER WAR is based on the film 'War Games' and the alarm bells have sounded at the North American Defence System. A Thermonuclear attack is signalled, the player realises it is simulated, but the computer does not and the national defence system is in action. The player must crack the code, track and destroy simulated enemy missiles before the world's total destruction. Supplied on cartridge for the Vic 20 and needs a keyboard or joystick. £19.95.

SUBMARINE COMMANDER. The player is in command of a submarine patrol and must destroy all the enemy ships. The Sonar can detect ships under water and the submarine can dive and rise to periscope level. The instruments must be checked and enemy destroyers are on the alert. Available on cartridge for the Vic 20 and uses a keyboard or joystick. £24.95.

RIVER RESCUE. The player is in control of a patrol boat and wants to rescue a team of explorers lost in the jungle and collect the reward offered. Navigation is difficult, and obstacles must be shot or avoided. Comes on cartridge for the Vic 20 (16k) and needs a joystick. £19.95.

MUTANT HERD. A power house is being threatened by hordes of crazy mutants. The player assumes the role of a Mutant Slayer and uses two lasers to keep them back whilst trying to find their burrow mouth. The mutant eggs inside must be destroyed, but there is a detonator fixed to them. One or two players. Comes on cartridge for the Vic 20 and uses a keyboard or joystick. £19.95.

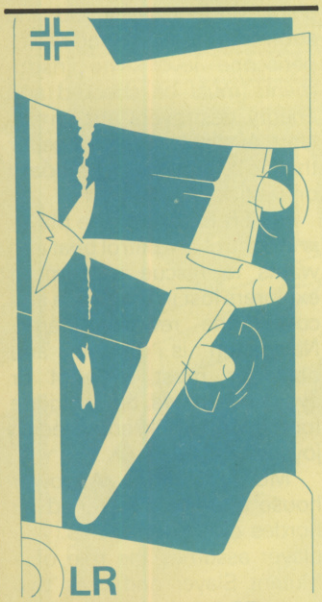
MEDIEVAL JOUST. Here the player challenges the kings knights to a tournament. After

the first one the player must then fight seven at one time. Three skill levels are available. Comes on cartridge for the Vic 20 and controlled by joystick or keyboard. £19.95.

CHANNEL 8

ASTRAL ZONE gives you two neutronium cannons mounted on a terramobile and a magnetic phase shield are all the player has with which to defend the earth from Vengorian fighters. It has 3-D graphics and sound. Comes on cassette for the CBM 64 and requires one joystick. £9.95.

LANDER – as a Trainee Space Commander, the player has to pass various landing tests before being awarded his wings. It is important to land successfully on all the zones. Four scenes and three levels add to the difficulties. Available on cassette for the CBM 64 and needs a joystick. £9.95.



LR MAINCOMP

BATTLE OF BRITAIN is a war game in which the aim is to reduce the German Luftwaffe so that it can longer pose a threat to Englands major industrial cities. 12 fighter squadrons are available for the player to use. Supplied on cassette for the Vic 20 (16k) and requires the keyboard. £9.50.

A.L.I.C.E IN W.U.N.D.E.R-.LAB takes place in a Nuclear Defence laboratory where the new reactor has been sabotaged. Meltdown will occur unless the player can move back through time and undo the damage. H.G. Walls has the key to a time machine, but he is in a maze drunk. There are three levels of difficulty. Comes on cassette for the CBM 64 and played with a keyboard.

BRAIN STRAIN is based on the Mastermind Peg Game. The computer selects a secret code and the player must try to break the code in 10 attempts. Three levels of difficulty. Comes on cassette for the CBM 64 and played with a keyboard.

IMAGINE SOFTWARE

CATCHA SNATCHA is based in a super-store with housewives doing their shopping. The player assumes the role of a shop detective. Collecting lost property, lost kids and dealing with bomb scares are all part of the game. Available on cassette for any Vic 20 and requires a keyboard. £5.50.

ARCADIA-64 – the Atiaran fleet are poised to attack and the player manning the Arcadia must repel them. An inter galactic battle played on several levels. Available on cassette for the CBM 64 or the Vic 20 and needs a joystick. £5.50.

BEWITCHED – Mordread has cast a wizard into his dungeons and transformed him into a key. He must escape by opening four sets of doors while fighting the ghosts and ghouls. Involves changing colour to match the doors. Comes on cassette for the Vic 20 and played with a keyboard. £5.50.

MANDATTA

TAXMAN is a variation on a popular theme. The player must rush around eating as much money as possible while the taxmen chase and try to bankrupt him. 6 levels of play. Available on cassette for the CBM 64 and played with a keyboard or joystick. £5.65.

SUPER COPTER – the player assumes the role of commander of a supercopter. The aim is to land on an island and defuse a nuclear bomb ready to go off. Hazards abound; laser screens, radar balloons and air missiles. Supplied on cassette for the CBM 64 and played with keyboard. £5.65.

GAMES MACHINES

THE FABULOUS WANDA is an adult fantasy game! The player is wandering round the universe looking for fun and is forced by the evil Brutus to seek the secret of life, the Universe and everything, known only to Wanda. Wanda must be sought on the planet COPUS. Comes on cassette for the CBM 64 and played with a keyboard. £7.95.

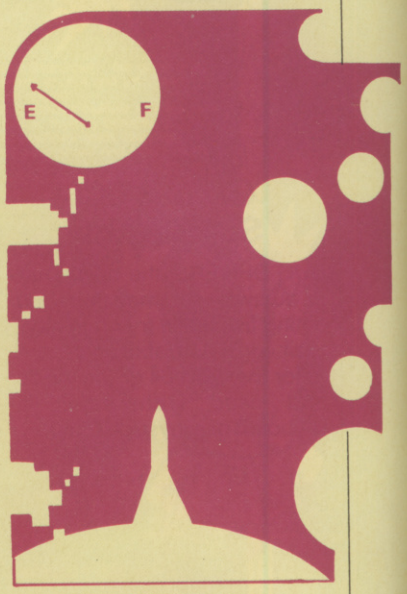
EGBERT is a game with more than a bit of humour. The TEBBITES have invaded and Egbert who was working on the production line at LEYSPACE is being plagued by deadly pets. Egbert must take care of a egg and any damage to it could be fatal. He must also earn a decent wage to survive. Comes on cassette for the CBM 64 and requires joystick. £7.95.

VIRGIN GAMES

FALCON PATROL – the sole survivor of the Falcon patrol must stop jets attacking oil installations and refuelling bases. The jet is armed with 100 missiles and a radar. The game gets progressively more difficult. Available on cassette for the CBM 64 and neds a joystick. £6.95.

BRITMANIA is set inside the data-bus of the '64:' The player must get past a neutron flow and reach the central core. A laser cannon is used to shoot BITS sent out by the C.P.U. Once shot a BIT mutates into a POD. There are several levels. Available on cassette for the CBM 64 and needs a joystick. £6.95.

ENVAHI – an invasion force is attacking a ginat dam above a city which supplies water and hydro-electric power to the people. The player is controlling a helicopter gunship and must protect the people from the enemy. Comes in cassette for the Vic 20 (8K) and can be played with a keyboard. £6.95



LYVERSOFT

LUNAR RESCUE is a game in which the aim is to rescue three marooned scientists from the moon by landing a rescued aircraft while a meteor storm ranges. Comes on cassette for the unexpanded Vic 20 and uses a keyboard or joystick. £5.95.

DEMON DRIVER players have a phobia about cats and if one crosses the road it has to be run over. Unfortunately the cats have their friends who come to their aid. Supplied on cassette for the unexpanded Vic 20 and played with a keyboard or joystick. £5.95.

CRAZY CLIMBER AND APPLE BUG are two games in one package. In Crazy Climber the player must climb scaffolding and grab floating balloons and in Apple Bug the player must eat life saving apples and watch out for the bugs. Comes on cassette for the unexpanded Vic 20. £5.95.

CHRISTMAS GIFTS

COMPENDIUM I is another double package. In GRAND PRIX the player has to try and win a race and in NUCLEAR ATTACK the player has to defend the city from the ICBM. Comes on cassette for the unexpanded Vic 20 and played with a keyboard or a joystick. £5.95.

COMPENDIUM 2 is the second in the Compendium series. Based on the TV game HI-LO which involves placing bets and in HEARTS AND DIAMONDS diamonds maraude around and hearts must be protected.

ANIROG

GALACTIC ABDUCTOR has a scenario in which the Earth is being attacked by a team of giant space hawks. They attack satellites, drop dangerous pods and carry off humanoids. A lot of accurate shots are needed to save everything. Comes on cassette for the VIC 20 (16K) and is played with a joystick. £7.95

MOOM BUGGY is all about the Moon Buggy patrol who are attacked by fighters in a star cruiser. The buggy must manouvere over lunar rocks, across craters and destroy the alien foe, Landscape changes constantly. Available on cassette for the CBM 64 and needs a joystick. £7.95.

LAB DAB – Sam the Painter must paint a large area with a little pot that constantly needs refilling. Dusturbed woodworms come out of hiding and chase him, fortunately they can only move in the painted areas. The worms get progressively cleverer. Comes on cassette for the unexpanded Vic 20 and can be played with a keyboard or a joystick. £5.95.

KRAZY KONG has abducted a maiden and trapped her at the top of his lair. The player must jump over barrels while climbing scaffolding and ladders to rescue her. Each of the four screens presents different obstacles. Supplied on cassette for the Vic 20 (16K) and played with a keyboard or a joystick. £7.95. (KONG is a similar game for the CBM 64).

SKRAMBLE – the earth has finally been taken over by the Cobrons and they have left the government in charge of its command module. A fighter plane on a suicide mission must destroy the base which has a formidable defence system. Comes on cassette for the CBM 64 and needs a joystick. £7.95.

THE DUNGEONS is an adventure game where Dragons and Monsters are guarding the magic basket containing the secrets of the Lower Dugeons. The role of fighter or magician can be assumed and there are over 100 chambers to explore. Comes on cassette for the Vic 20 (16K) and played with a keyboard. £5.95.

HEXPERT – the evil witch ZOGANAAR has forced Bert to play on her 3D hexagonal pyramid. He must jump around on the steps and avoid large balls. COILY the snake is also a threat and must be lured to his death. Comes on cassette for the CBM 64 and is played with a joystick. £7.95.

MR CHIP

JACKPOT is a computerised version of the fruit machine. The combinations are similar to the ones in the arcades and the good ones win money, for example four bells wins the player two pounds. Each go costs ten pence. Supplied on the cassette for the unexpanded Vic 20 and played with a keyboard. £5.50.

KWAZY KWAKS – The object of the game is to shoot all the targets in the shooting gallery before the time runs out or before the bullets are all lost. Eight different speed levels provide more challenges. Supplied on cassette for the Vic 20 and can be played with a joystick or a keyboard. £5.50.

PACMANNIA has several options for the player to choose from: Key Control, a Visible or invisible maze, still or moving Power Pills, Dots or Crosses. There are three lives per game. Supplied on cassette for the Vic 20 (3k) and can be played with a keyboard. £5.50.

THREE GAMES is a cassette with three games of change: Mini-Roulette, Pontoon, and Hi-low. Computerised versions of these casino games. For the Vic 20 and played with the keyboard. £5.50.

WESTMINSTER is all about democracy. Up to four players can play and emulates the processes in the general election. The player has to lead a party and tour through 60 constituencies buying votes in order to win. Supplied on cassette for the Vic 20 and played with a keyboard. £5.50.

LUNAR RESCUE – the player is in a mothership attempting to steer down onto a landing pad avoiding the meteors. These change into aliens adding to the difficulties. Three lives per game. Comes on cassette for the CBM 64 and played with a keyboard or joystick. £5.50.

MERLIN SOFTWARE

CRAZY CAVEMEN – long ago a sabre tooth tiger ambushed and scattered a hunting party. The player is one of these hunters and has to return home. The journey is beset with hazards with Rolling Rocks, Dinosoars, Dodos and Prehistoric Birds. Available on cassette for the CBM 64 and needs a joystick.

BLUE MOON puts you in charge of a spaceship. The player must rescue the sister-ship and crew, trapped on a hostile planet and take them to the Blue Moon. During the journey, Comet Storms, Blue Bouncers and a Tecom Man are hazards to be negotiated. Comes on cassette and is played on the 64 with a joystick.

LLAMASOFT

HOVER BOVER – Gordon Bennet has borrowed his neighbours FLYMO lawnmower and has to mow through as many of the 16 lawns as he can before being caught. Dogs, gardeners and overheated mowers are obstacles to be negotiated. Supplied on cassette for the CBM 64 and played with the keyboard. £7.50.

ATTACK OF THE MUTANT CAMELS is a popular game in which aliens have captured and mutated some camels into 90 ft high laser firing beasts. The aim is to pilot a spaceship and destroy them. Various of the game parameters can be altered and there are 31 skill levels to be negotiated. One or two players with joystick. Available on cassette for the CBM 64. £7.50.

CHRISTMAS GIFTS

ALLIGATA

SQUASH A FROG is a version of the arcade game. The frog must traverse a motorway with fast traffic, a river bank full of snakes and a river with snakes, alligators and submerging turtles. Comes on cassette for the CBM 64 and played with a keyboard or joystick. £7.95.

BAT ATTACK – the player is being attacked by killer bats first and then by clusters of asteroid discs. The games gets progressively faster and increasingly difficult. Comes on cassettes for the CBM 64 and played with a keyboard. £7.95.

AZTEC TOMB is an adventure game set in the Amazon forest. The aim is to find the lost Aztec tomb. The screen is divided into graphics and text. Supplied on cassette for the CBM 64 and needs a keyboard. £7.95.

BALLOON RESCUE – A balloon has a low fuel level and the player must move it through a maze of rocks and caves to find some cylinders. The pull of gravity is an obstacle. Available on cassette for the CBM 64 and played with a keyboard or a joystick. £7.95.

DAMSEL IN DISTRESS – the player has been weakened by poison and must rescue the princess who has the antidote. Hazards on the approach include building a bridge, menacing soldiers, ghosts and collecting diamonds. Supplied on cassette for the CBM 64 and played with a keyboard or joystick.

BRANDS is a motor racing game. The player has to manouevre a racing car through the streets. Points are won for overtaking other drivers, avoiding obstacles and night driving. Available on cassette for the CBM 64 and played with a keyboard. £7.95.

HAUNTED HOUSE is set, of course, in a haunted house with men appearing through doors and Spooky the ghost must capture enough souls to save himself from eternal damnation. They can be caught straight away or in the maze. Comes on cassette for the CBM 64 and used with a keyboard. £7.95.

MR MICRO

BENGO the eskimo has to be protected from a half witted aggressive Yeti. Blocks of ice can be used to throw at the Yeti for protection. Comes on cassette for the unexpanded Vic 20 and played with either a joystick or a keyboard.

AMIGO – the bandits are chasing Amigo and he must escape by running round blocks and into various corners of the city. They have got guns but Amigo hasn't. Supplied on cassette for the Vic 20 (8 or 16k) and used with a joystick. £6.90.

HUMPHREY must land on all cubes and change their colour, but he is being chased by an atomic bomb. Comes on cassette for the Vic 20 and can be played with a joystick or keyboard. £6.90.

MYSTERIOUS ISLAND – a prisoner has escaped from prison in a hot air balloon and must land on Mysterious island. Hazards include booby trapped minefields, killer bees, and force fields. Supplied on cassette for the Vic 20(16k) and played with either a joystick or keyboard).

DIGGER – the remote viewer shows the professor's path and the players must control the digger to collect rare gems. These are protected by Micronits and a stalactite could cause problems. Comes on cassette for the Vic 20 (8 or 16k) and needs a joystick. £6.90.

L.D.S. SOFTWARE

MULTI-PACK is a package which contains three games – Nine Mens Morris, Gammon 64 and Cymon. Gammon 64 is the computerised version of backgammon and can be played with the computer or another person. Nine Mens Morris is a two player board game set out like a grid. Each person has nine counters and the game develops into a fight. In Cymon, four colours are represented on the screen with a different sound for each and the aim is to make the longest sequence possible. Available on cassette for the CBM 64 and uses a keyboard. £7.95.

BUBBLE BUS

HUSTLER is written in machine code and using sprite graphics, the program has potential for six games, each catering for one or two players. Music is included. Available in cassette form for the CBM 64 using the keyboard. £5.99.

ALIEN PANIC is a fight against time to avoid the alien being. If it catches up the player can dig a hole to try and escape. For the CBM 64 on cassette and can be played with a joystick or the keyboard. £3.99.

GOLDRUSH is an adventure program with graphics and a prize of real gold for the successful adventurer. Comes on cassette for the Vic 20 (3.5k) and needs a keyboard. £6.90.

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EXTERMINATOR, as the title suggests involves zapping everything in sight – whether it is moving or not. Snakes, spiders, wasps all bombard the player. Supplied on cassette for the unexpanded Vic 20 and can be played with joystick or keys. £3.99. Also available for CBM 64 at £5.99.

THE CATCH – alien bombs are bombarding the city and the player has to catch everything to stop the destruction. The game gets progressively faster and more difficult. Uses high resolution graphics and has sound. Available for the unexpanded Vic 20 on cassette and is played with a keyboard or joystick. £3.99.

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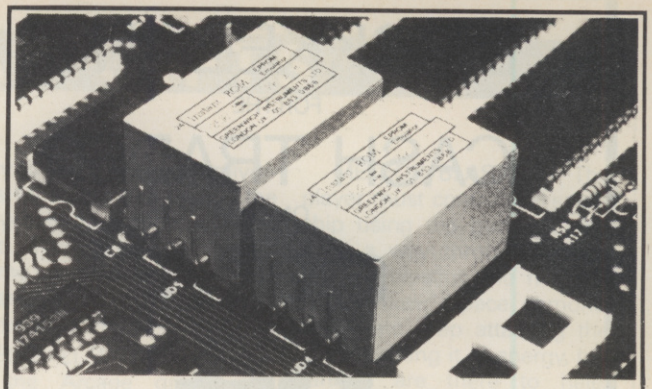

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CHRISTMAS GIFTS

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ABRASCO

VIXPLODE-64 is a board game in which a player must gain possession of all the squares. A VIXIPLOSION occurs if the number of counters equals the number of the adjacent sides. There are 6 levels of difficulty. Comes on cassette for the CBM 64 and can be played with a keyboard or a joystick. £8.50. (Also available for the Vic 20).

FLY SNATCHER is set in a field with bushes and flies where the only way to survive is to snatch flies and hide in a bush. Also in residence is a hungry weasel which tries to eat the player. Gets progressively faster. Available on cassette for the unexpanded Vic 20 and used with either a joystick or keyboard. £7.50.

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PINBALL WIZARD is similar to the Arcade game, the plunger releases the ball and the bumpers, rollovers, slingshots and 3 flippers are all there to help the scoring. 5 balls per game and suitable for one or two players. For the unexpanded Vic 20, comes in cassette form and is played with the keyboard. £7.95.

TERMINAL INVADERS is a game of aerial bombardment. The destruction of enemy ships, evasive tactics, and clever use of the defense shields all help postpone eventual defeat with the Bug-eyed monster. For the unexpanded Vic 20, comes in cassette form and is played with keyboard. £5.95.

SUPER DOGFIGHT displays an aerial view of an imaginary duel between two World War I aces. Clear sky and dense white cloud provide the setting as two players fly their biplanes into combat. Comes on cassette for the CBM 65 and can be played with two joysticks or joystick and keyboard. £9.95.

METEOR BLASTER – The player must control the space ship using the gunsight and steer a way through meteor storms, blasting the meteors with a laser. Space demons, UFO's etc keep attacking the ship, draining it of energy, but tankers are there to help. Played on unexpanded Vic 20, comes in cassette form and can be played with a joystick or keyboard. £5.95.

GRIDDER – all the squares in a grid must be coloured in before moving into the next one. An evil being follows the painter and he must use tactics to evade being touched. There are 256 mazes and the number of chasers increases. Played on the Vic 20, comes in cassette form and can be played with a joystick or a keyboard. £7.95.

SKRAMBLE – the space fighter must be piloted through eight different sections, for instance rough terrain, caves and skyscrapers. Each has its own forms of aliens and obstacles. Played on the unexpanded Vic 20, comes in cassette form and can be played with a joystick or a keyboard. £7.95.

MAGIC MIRROR is an adventure game for the Vic 20 (8 or 16k). The aim is to retrieve the magic mirror from somewhere in the programmers landscape. Follows standard adventure format. Split screen display, with the location details at top and conversation at bottom. Supplied on cassette and played with a keyboard. £9.95.

THE CURSE OF THE WEREWOLF is slightly different to standard adventure games. It involves solving problems, collecting and manipulating items and finding clues. Monsters stalk the 70 locations occasionally presenting a challenge. For the Vic 20 (16k), it is supplied on cassette form and uses a keyboard. £9.95.

RESCUE FROM CASTLE DREAD is a typical adventure format. The computer informs the player of location and the surroundings. The adventurer has to find way through

CHRISTMAS GIFTS

scenario with 70 locations solving problems and collecting items to help him. For the Vic 20 (16k), supplied on cassette and uses a keyboard. £9.95.

LINE UP 4 and REVERSI are two educational board-type games on one tape. Line Up 4 features a 7×7 matrix in which the player and computer take turns to drop counters. The aim is to form a line of 4 counters in any direction. Reversi is the computerised Othello in which the player competes against the computer. Involves a lot of thought. Available on cassette for the unexpanded Vic 20 and uses a keyboard. £7.95.

GET LOST is a maze game in which there are six different levels of complication to play on. The aim is to get through the maze in as few moves as possible and on the easiest level, a plan and 3-D view of maze and direction helpers are there to help. Available on cassette for the unexpanded Vic 20 and uses a keyboard. £5.95.

C.P. WHITE SERVICES

PONTOON is a computerised version of the card game. Can be played with two players or with one player against the computer. Available on cassette for the CBM 64 and played with a keyboard. £3.50.

HAUNTED CASTLE is set in a haunted castle! The player wanders through several rooms and in each room there are objects which can be picked up or left. Intended to be a brain teaser. Supplied on cassette for the CBM 64 and played with a keyboard. £3.50.

MICROS

VULTURES – vultures and eggs fly out of the sky and the player has to destroy them before they carry him off. The eggs provide added danger. Features include scores and high scores and bonus lives. Available in cassette form for the CBM 64 and used with a joystick. £6.95.

IMAGINATION UNLIMITED

SNAKE PIT is staged in a snake pit, the gobbler must eat all the snakes and their eggs. As the eggs are eaten more snakes are freed and once all the snakes have been eaten the game begins again. Supplied on cassette for the CBM 64 and played with keyboard or joystick. £7.99.

SHADOWFAX is Gandalf's horse in Lord of the Rings and he must be guided through an attack from the riders of Sauron. Thunder bolts are used to protect Shadowfax from the agents of Lord Modor. For the CBM 64, supplied on cassette and played with a keyboard or joystick. £7.99.

SIEGE challenges you to defend a castle surrounded by marauders. Dropping rocks dislodges them, but makes the onslaught faster and holding them back becomes more difficult. For the CBM 64, supplied on cassette and can be played with a keyboard or joystick. £7.99.

CHALKSOFT

Chalksoft specialise in producing educational tapes suitable for a Vic 20 with any expansion RAM pack fitted. They can all be used at home or at school.

NOTE INVADERS is made up of three programs to help children learn to read music. STAFF 1 and STAFF 2 teach all the notes. INVADERS is a version of the game where musical notes attack the players base, failure to recognise them result in catastrophe. Supplied on cassette for the Vic 20 (any RAM expansion) and played with a keyboard.

DECIMALS is for children aged 9 and over, this program helps them to learn decimals. Firstly an interactive test assesses them and then sets a lot of practice with the sums found difficult. Includes subtraction, multiplication, and division. Comes on cassette for the expanded Vic 20 and is played with a keyboard. £9.25.

INKOSI is an African King who must rule his kingdom for ten years, involving the planning of stocks and stores of maize, cows and other supplies. The Witchdoctor and raiding UMO tribe present problems and basic mathematical skills are needed. Available on cassette for the expanded Vic 20 and played with a keyboard. £6.95.

INVISIBLE MAN draws and labels a Cartesian grid and then hides a large cartoon. Shots have to be taken and compass point clues are given e.g. GO and SOUTH to help find him. Three levels of difficulty and suitable for ages 4-17 years. Supplied on cassette for the expanded Vic 20 and used with a keyboard. £6.95.

RABBIT SOFTWARE

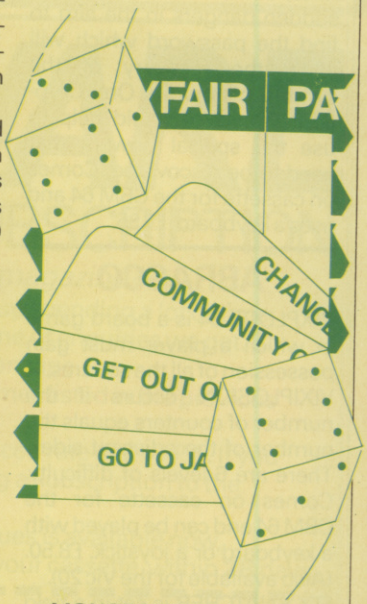
PAKACUDA is set in the Caribbean sea, the barracuda must swim around and eat as many fish and electric eels as possible while fighting off attacks from ravenous octopuses. Supplied on cassette for the CBM 64 and played with a joystick. £5.99.

CENTROPODS maroons you on a hostile planet with only a blaster as a weapon. The player must withstand waves of centrons and avoid spinning buzzers, falling missiles and stick glue pods. Comes on cassette for the CBM 64 and requires a joystick. £5.99.

ESCAPE-MCP – the computer has gone mad and the player de-atomized. The only escape is to get through 9 levels of logic evading the MCP which knows of the escape plans. Available on cassette for the CBM 64 and needs a joystick. £5.99.

CYCLONS makes you the commander of the defending forces of Sol who must destroy the invading Warships of the Cytron empire. First the Cyclon fighters appear and then the Pulsar Death Ship. Comes on cassette for the CBM 64 and requires a joystick. £5.99.

ANNIHILATOR takes you to a distant planetoid whose rocky terrain is home for humanoids. They must be defended from hovering Landers. Baters, Bombers, Pods and Swamers present added difficulties. Available on cassette for the CBM 64 and played with a joystick. £5.99.



MONOPOLE is based on the famous board game with a similar name! The player must go around London buying properties and developing them. High rents must be charged to try and bankrupt the opponent but overtrading is a danger. Available on cassette for the CBM 64 and needs a keyboard. £5.99.

CHRISTMAS GIFTS

ROMIK

ZAPPY ZOOKS is a game in which a whirly has to be guided through space corridors avoiding Zooks and collecting alpha particles. The Zooks become weak and easily caught if their power plug is removed. Supplied on cassette for the CBM 64 and needs a joystick.

DICKY'S DIAMONDS – Dicky the Owl has to retrieve diamonds stolen by Stephen the Spider by weakening his webs until they fall. There are 70 different starting levels. Available on cassette for the CBM 64 can be played with a joystick or keyboard.

FOOL'S GOLD is a classic adventure game. Treasure is hidden somewhere in the maze of tunnels of an old mining works and there are over 150 rooms to enter. Wild beasts make the search hazardous. Supplied on cassette for the CBM 64 and played with a keyboard.

TOMBS OF XEIOPS is set in the Egyptian desert, treasure is hidden within some tombs. Deadly cobras make the task of retrieving this treasure difficult and there are over 100 rooms to explore. Available for the CBM 64 on cassette and is played with a keyboard.

INTERCEPTOR

FROGGER 64 is written in machine code for the CBM 64, the aim of the game is to get give defenceless frogs across a busy road and a hazardous river. Each screen change brings different dangers and it contains a Hall of Fame feature. Comes on cassette for the CBM 64 and a keyboard or joystick can be used. £7.00.

SCRAMBLE 64 – The caverns honeycombing the alien planet must be penetrated, but the defending forces are ready and prevent any vital energy coming from the mothership. To counteract this, the player must destroy the enemy deflection disks and receive energy. Comes on cassette for the CBM 64 and controlled with a joystick or keyboard. £7.00.

CRAZY KONG has captured a girl and taken her to the top of his steel fortress. The aim is to rescue her, but several screens must be negotiated before kong can be destroyed. All the diamonds must be collected on the way up. Available on cassette for the CBM 64 and can be played with either a joystick or keyboard. £7.00.

PANIC 64 – the aim is to trick the monsters to fall into holes created by bombs while they are chasing the player. Flying shrapnel has to be avoided and the game gets progressively more difficult. Three lives per game. Comes on cassette for the CBM 64 and can be played with a joystick or a keyboard. £7.00.

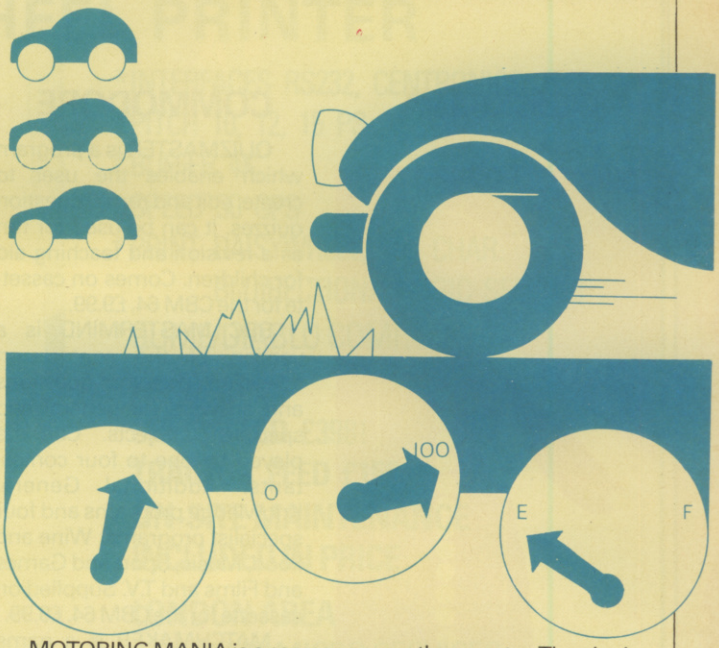
SPRITE MAN – four hungry ghosts pursue the player while trying to clear the maze of dots. Around the maze pills, fruits and other objects lie around giving anyone who eats them extra power. Supplied on cassette for the CBM 64 and played with a joystick or keyboard. £7.00.

AUDIOGENIC

ROAD TOAD – the toads in the mating season have to get to their breeding grounds and risk death from the road and river. The player must escort the toads and negotiate all the hzards – cars, snakes, crocodiles. Comes on cassette for the CBM 64 and needs a joystick. £8.95.

RENAISSANCE is a CBM 64 version of the board game Othello. It incorporates similar functions of the game, including fetures such as 9 levels of play and changing the level and sides. Controlled with a joystick and supplied on cassette for the CBM 64. £8.95.

WORD FEUD – A 'word find' game for one or more players. The aim is to find the right word hidden amongst a jumble of words on the screen. It is partly educational and suitable for all ages. Comes on cassette for the CBM 64 and can be played with a joystick or keyboard. £8.95.



MOTORING MANIA is a car race across the country. The aim is to drive the car very fast round the track avoiding obstacles, hazards and other traffic. There are 5 cars allotted to each game and a dashboard display and sprite graphics are there to help. Available on cassette for the CBM 64 and requires a joystick.

Audiogenic also manufacture and distribute Supersoft and Kavan software.

KAKTUS – A Gopher must protect the lone giant cactus from the attacking wasps and hornets. Acid droppings, moles, buzzards and their eggs try to impede any progress. Comes on cassette for the Vic 20 (8K) and can be played with a joystick or keyboard. £7.95.

MANGROVE – deep in the mangrove swamps a culture of life saving cells have been attacked by deadly germ microbes. The player must mastermind the regeneration of the cell culture. Smart pills can help in difficult moments. Supplied on cassette for the unexpanded Vic 20 and can be played with a joystick or keyboard. £7.95.

A COUNTRY GARDEN is infested by mutant pests – Caterpillars, fleas, snails and even mushrooms. Aggressive armoured moles are introduced to the grden and the player must guide them as they are blind. 4 moles can be used to destroy as many vermin as possible. Comes on cassette for the Vic 20 (8K) and played with a keyboard or joystick. £7.95.

BONZO – the player assumes the role of a workman who starts at the bottom of the screen and has to clear all the boxes from different levels by walking along and climbing up ladders. Bonzo guards these boxes! Four men for each game. Available on cassette for the Vic 20 (8K) and played with the keyboard. £7.95.

PIT Hans the handyman has to cross the screen collect a bag of gold and return with it while avoiding acid snowflakes. Blocks provide some shelter. Three lives available for each game. Comes on cassette for the unexpanded Vic 20 and can be played with keyboard or joystick. £7.95.

GRANDMASTER is a computerised chess game. It is possible to play in a variety of colours using the square board. Facilities include a function to force the grandmaster to make the move it is considering. Comes on cassette for the CBM 64 and Vic 20 and played with a keyboard. £17.95.

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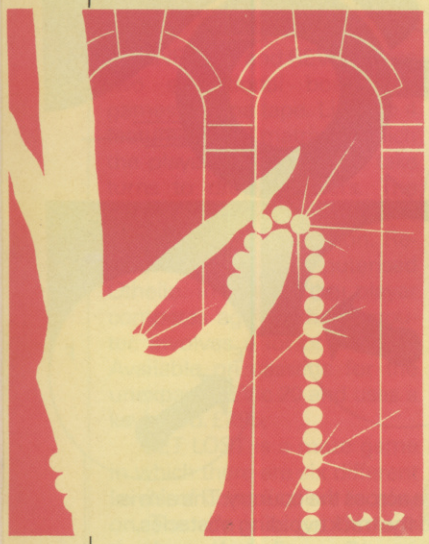
QUICKSILVA



RING OF POWER – the Colourful King has been driven from his kingdom and with him went the secret of the location of the Crown Jewels. An adventure game where the player must find the jewels and become King. Can be played with graphics or text. Available on cassette for the CBM 64 and used with a keyboard. £9.95.

AQUAPLANE – Aim is to water ski in an aquaplane avoiding and negotiating obstacles such as rocks, logs and the great white hungry. Played with a joystick and comes in cassette for the CBM 64. £7.95.

PURPLE TURTLE is a game which involves stepping over purple turtles carrying items backwards and forwards across a river. Graphics and colour abound in the program. Available on cassette form for the CBM 64 and played with a joystick. £7.95.

QUINTIC WARRIOR is a game involving the extraordinary Quintic Warrior and his stand against sinister Crabmen and various mangled mutants. Using his sixth sense and a Blaster the player must protect the domed city. Comes on cassette for the CBM 64 and used with a joystick. £7.95.

COMMODORE

QUIZMASTER is a program which enables the user to create, edit and run 40 question quizzes. It can be used for fun as a revision and teaching aid for children. Comes on cassette for the CBM 64. £9.99.

BBC MASTERMIND is a version of the contest on television. There are questions and answers for general and specialist subjects. Can be played by one to four contestants. Additional General Knowledge programs and four specialist programs; Wine and Food, Music, Sport and Games and Films and T.V. Supplied on cassette for the CBM 64. £9.99.

MATCHMAKER is a game which enables everyone to get to know each other! Each person has to answer 25 personal questions and later the results have to be read out. Comes on cassette for the CBM 64 and the Vic 20. £9.99.

ASK THE FAMILY is based on the TV game it has written, musical and graphical general knowledge questions. Two groups of people can play and each side presses the buzzer to answer a question. Comes on cassette for the Vic 20. £9.99.

FACE ACHE presents a face of strange characteristics and the aim is to reconstruct this face. Available on cassette for the CBM 64 and played with a keyboard. £4.99.

SPIRATES AND SNOWMEN are two educational games for the 5-11 year olds. In Spirates the player is manning the guns of one of two ships locked in combat. Answering multiplication questions correctly increases the chances. In Snowmen, two players are racing to build snowmen. Correct answers to multiplication and addition questions increases your chances. Several levels of difficulty. Comes on cassette for the CBM 64. £4.99.

DEPTH CHARGE promotes the player to the position of commander of a frigate and must prevent enemy submarines from entering a secret naval base. Mines must be avoided. Available on cassette for the CBM 64. £4.99.

LABYRINTH is a simple maze game. The size of the maze and its degree of difficulty can be changed. The aim is to find the way out. Comes on cassette for the CBM 64. £4.99.

SOOPER FROOTER incorporates all the features of the fruit machine with hold, nudge and random respin. The player starts with two pounds. Supplied on cassette for the CBM 64. £4.99.

MAGGOT MANIA involves a creature with a venomous sting which has three lives. He must kill the maggots before he is eaten alive. Spiders and snails must also be destroyed. Comes on cassette for the CBM 64. £4.99.

SUPER BLITZ asks the player to destroy a whole city but it is guarded by King Kong. The city must be bombed strategically to isolate a building so that Kong reveals himself. Available on cassette for the CBM 64. £4.99.

STELLAR WARS involves a planet which is under attack from aliens and the player must defend using two laser neutron guns. Comes on cassette for the CBM 64 and needs a joystick. £4.99.

EMMET ATTACK – The emmets are approaching as the player sits in a bunker on an alien planet. They must be located and destroyed before they reach the bunker. Comes on cassette for the unexpanded Vic 20 and played with a joystick or keyboard. £4.99.

SPECTRE traps you inside a haunted mansion filled with treasure, the player must escape by finding and collecting the treasure. Monsters, trap doors, and bottomless wells provide added dangers. Comes on cassette for the Vic 20 (16k) and needs a keyboard. £4.99.

PATIENCE is a computerised version of the card game. A shuffled pack of cards must be sorted into suits and at the end of the game must be in ascending order. Contains graphics. Supplied on cassette for the Vic 20 (16k) and uses a keyboard. £4.99.

STACK

TWISTER is based on a crossword puzzle the player is competing against the computer. Assemble words from the letters that the computer provides. Four letters can be stored and those that cannot be used can be discarded. Comes on cassette for the CBM 64 or Vic 20 and needs a light pen.

SHUFFLER – the player is presented with a grid of shuffled letters and they must be arranged alphabetically, moving one letter at a time into a vacant square. Comes on cassette for the CBM 64 and the Vic 20 and needs a light pen.

LIFE – the player must form the membranes of cells into a shape by adding or deleting with the lightpen. Once satisfied with the shape and GO is pressed the colony expands and contracts depending on the cell conditions. Comes on cassette for the CBM 64 and Vic 20. £5.75.

LOST IN THE LABYRINTH – the player is lost in the labyrinth and danger abounds. The light pen is needed to escape to safety. Supplied on cassette for the 64 and Vic 20. £5.75.

SIMON is a version of the well known 'Simon' game. Four coloured blocks are displayed flashing in sequence and must be copied with the light pen. The sequence increases in length and speed. Three chances per game. Comes on cassette for the CBM 64 and the Vic 20. £5.75.

OTHELLO is similar to the original board game. The player must attempt to trap the opponents piece in vertical, diagonal and horizontal directions. The aim is to gain as many pieces as possible. Comes on cassette for the CBM 64 and the Vic 20. £5.75.

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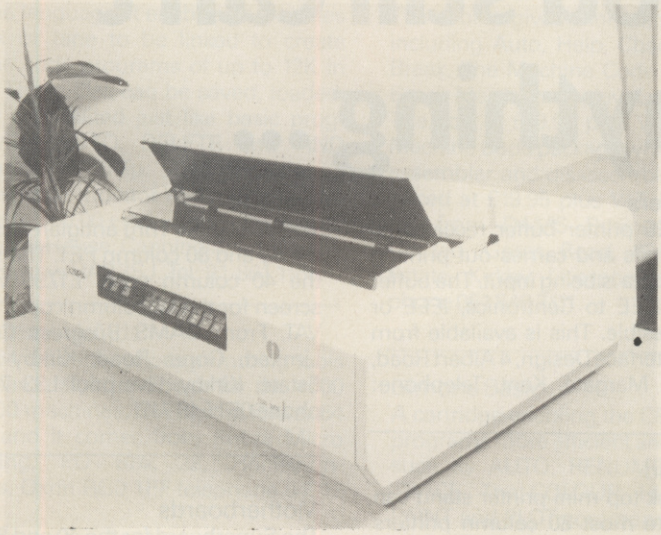

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FROM CAMERA TO COMPUTER

The ORTHOLOG MODEL 383 TV Interface is the fastest on the market: it collects images in one frame time (1/25 second), thereby letting you examine either static or moving scenes. It contains a 128-by-128 pixel, 6-bit data store: a comprehensive software package is provided which contains routines for displaying black-and-white images or images with 5 or 10 grey levels, data transfer to and from disk is available and images with 64 grey levels can be recorded photographically. Separate programs are available for object counting, area and perimeter measurement, contouring and velocity or displacement sensing. The Model 383 costs only £850 all-inclusive and the measurement programs are £100 each: demonstrations can be arranged. For more information contact:

Ortholog Ltd., PO Box 72, Edgware, Middlesex HA8 6RD. Tel: 01-952 2459

... and if you still can't find anything ...

Adaptors

An IEE Bus-adaptor allows the user to use standard CBM/PET IEEE disk drives anc printers with the VIC and 64. Batch file loading and mini DOS support as well as multi-user bus sharing and simultaneous use of the serial bus. £59 plus VAT. Available from JCL Software, 47 London Road, Southborough, Tunbridge Wells, Kent. Telephone 0892 27454.

Power Monitor Unit

Fluctuations in the power supply can damage equipment and destroy data. Sentry is a portable monitor unit that will monitor any 240V power supply and indicates fluctuations but does not prevent them. The cost of this is £45 and it comes from Mektronic Consultants, Linden House, 116 Rectory Lane, Prestwich, Manchester M25 5DB. Telephone 061 798 0803

Another voltage monitor unit is called Mainstay which filters and regulates the voltage going into the computer. This costs £49.95 plus VAT and p&p and is from Gould Power Conversion Division, Rhosymedre, Wrexham, Clwyd LL14 3YR Wales. Telephone 0978 821000.

Dust Covers

Protect your computer equipment with a soft PVC cover that is strongly made and water repellent. Covers for most Commodore equipment, but they can be made to suit customer requirements. Prices start at £1.95. They are available from Sherborne Designs, Victory House, 8A The Rank, North Bradley, Trowbridge, Wiltshire BA14 9RP. Telephone 02214 4425.

Languages

Forth for the 64 and VIC. This language allows interaction, structured program development and will work in any number base. A text editor and macro assembler are included with the 64 version. The cost for both machines is £33. The Personal Assembly Language for the 64 (PAL 64) is a machine language assembler/monitor that takes up just 4K bytes and costs £69. Both of these can be obtained from Kobra Marketing, PO Box 28, Henley-on-Thames, Oxon RG9 1PF. Telephone 04912 2512.

Printer Buffers

The PET IEEE printer buffer receives all data in seconds and carries out printing whilst other data is being input. The buffer is 14K and IEEE to Centronics, IEEE or RS232 is possible. This is available from Computer Interface Design, 4 Albert Road, West Brook, Margate, Kent. Telephone: 0843 294648.

Printer Stand

The new desk top mini printer stand can accommodate most 80 column printers including the MX80. The stand has an easily detachable form tray. The dimensions of the stand are 15 inches × 12.5 inches × 10 inches. The cost of the stand is £22 and it is available from Action Computer Supplies, 6 Abercorn Trading Estate, Manor Farm Road, Alperton, Wembley, Middlesex HA0 1WL. Telephone: 01-930 3921.

Learing to type

A piece of software called Touch 'n Go is designed to enable the user to master the QWERTY designed keyboard and the numeric keypad. This course should have the user typing at a speed of 40 words per minute. At a cost of £25 plus VAT it is available from Caxton Software Limited, 10/14 Bedford Street, Covent Garden, London WC2E 9HE.

Screens

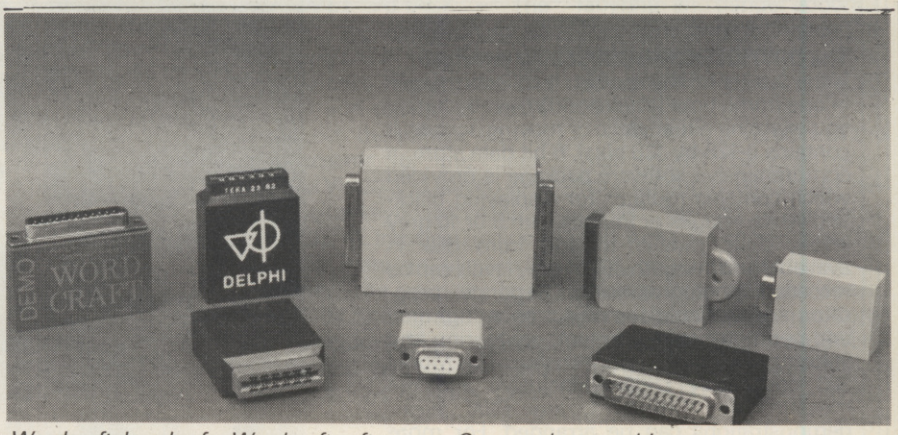
The VDU View Thru antiglare screen is for the 40 and 80 column PET. The screen for the 40 column costs £17.95 whilst the screen for the 80 column cost £19.95 plus VAT. From DAMS Business Computers Limited, Gores Road, Kirkby Industrial Estate, Kirkby, Liverpool L33 7UA. Telephone 051 548 7111.

Motherboards

The Superboard for the 40 and 80 column PET allows a selection of eight ROM/EPROM, RAM/ROMS from program control and will accept any combination of 2K or 4k ROM/EPROMS, RAM/ROMS. No wires, switches or soldering is required to install the board which costs £52.50. It is manufactured by Computer Interface Designs, 4 Albert Road, West Brook, Margate, Kent. Telephone 0843 294648.

Home Applications

REL is a control relay system for the VIC and 64 that plugs straight into the user port. It has six relay outputs and two inputs. The cost is £30 and it is available from Kobra Micro Marketing. PO Box 28, Henley-on-Thames, Oxon RG9 1PF. Telephone 04912 2512.



Wordcraft dongles for Wordcraft software on Commodore machines.

Dongles

Software protection devices for the range of Commodore machines are available from Wordcraft Systems for use with Wordcraft software. Each dongle contains a unique coding without which the software will not function. For CBM 4000, 8000, 700, VIC 20 and 64. From a starting price of £2.50, these are available from Wordcraft Systems, 43 Farley Road, Derby DE3 6BW. Telephone 0332 683892

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MIKRO 64

A fast 6510/6502 assembler for the CBM 64. Mikro simplifies programming in machine language. It enables source files on disk or tape to be linked to create machine code programs of up to 12K in length. These files can be saved, loaded, verified and edited just like basic programs with AUTO, DELETE and FIND commands to help. Also includes a machine code monitor and a disassembler. Costs 50.00+vat from Supersoft, Winchester House, Canning Road, Wealdstone, Harrow HA3 7SJ. Tel: 01-861 1166.

Programming Aids

Power 64 is a series of programming tools in the same style as Power for the 4000 and 8000 machines. The cost of Power 64 is £69 and it comes from Kobra Micro Marketing, PO Box 28, Henley-on-Thames, Oxon RG9 1PF telephone 04912 2512.

Merge is a product that allows the user to combine a separate routine and a program, simply by loading the Merge program. The cost is £7.95 and it is for PETs using 4040 disks. From Leader Systems, 85 High Street, Hampton-in-Arden, Solihull, West Midlands B92 0AE telephone 021 236 9768.

Programmers Aids

VICAID is a combination of a programmers toolkit and a Machine Code monitor. The toolkit gives nine extra commands including Auto, Help, Change, Step and Break. The Machine Code monitor gives Save, Memory display, Load and Verify. The cost is £19.95 plus VAT. VICOM is a Machine Code package which comes with assembler and disassembler. This is also priced at £19.95 plus VAT. Both products are from DAMS Business Computers Limited, Gores Road, Kirkby Industrial Estate, Kirkby, Liverpool L33 7UA telephone 051 548 7111.

Simons Basic

A cartridge enabling the CBM 64 to make programs more efficient and fast with aids such as AUTO, RENUMBER, KEY and TRACE. The COLOUR, HI-RES, CIRCLE, PAINT and PLOT commands can be used to facilitate the use of graphics. Complementing these, ae commands for creating sprites and user-defined graphics. It also contains structured programming commands so that within the programs, routines can be construed which can be labelled and called by name. 50.00. By Commodore tel: 0753 79292.

Security

Securing programs on the 8000 series machines can be done using Safeware which must be used in conjunction with the Pet-Speed compiler. Each unit has a unique code and no two Safeware packages are the same. The cost of this package is £24 plus VAT and is available from Mektronic Consultants, Linden House, 116 Rectory Lane, Prestwich, Manchester M25 5DB. Telephone 061 798 0803.

Expansion

Several switchable RAM packs and motherboards to extend the capabilities of the VIC. The 16K costs £34.50, 32K (which is also switchable to 3K, 16K and 24K) costs £55.20. The 4-slot motherboard is priced at £18.40. These are available from Alphascan Limited, Little BourtonHouse, Southam Road, Banbury, Oxon OX16 7SR. Telephone 029 575 8202.

The SRC 16K memory cartridge for the VIC 20 which can be upgraded to 32K. Games and utilities can be used in the X-ROM socket. The SCR16 can also have an expansion slot built in. Cost £27 from Solidisk Technology Limited. 87 Bournemouth Park Road, Southend-on-Sea, Essex SS2 5JJ. Telephone 0702 613081.

RAM Packs

The Flexirom 4 costs £33 and consists of a 4K CMOS RAM with battery back-up. Flexirom 8 is a new product providing the user with 8K CMOS RAM and battery back-up for £44. The Superflex Pager is another new product for £59. This consists of four EPROM sockets and two flexiroms.

All of these are for the PET and come from Clever Computer Controls, Clay court, Lower Hardres, Canterbury, Kent CT4 5PG. Telephone 022770 644.

Increase the VIC 20 to 19967 bytes with the 16K RAM pack which is switch selectable to 3K, 8K and 16K. This will cost £44.50. There is also the Tandem Expandable Expansion System which plugs directly into the back of the VIC. There is a ROM socket for more expansion and expansion slots for VIC 20 cartridges. This cost £34.95 and both products are available from Afdec Electronics Limited, 318 Kempshott Lane, Basingstoke, Hants, RG22 5LT.

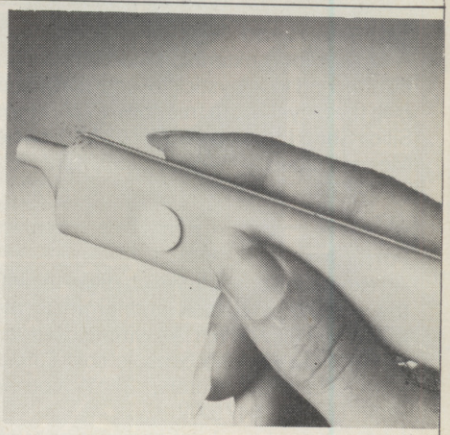
RAM Packs

For the VIC 20 there is a 16K RAM pack which costs £28.95. This price includes VAT and p&p and the memory expansion cartridge comes from Startech, 208 Aigburth Road, Aigburth, Liverpool L17. Telephone 051 727 7267.

The Vixen RAM cartridge gives the user the option of full 16K RAM or 8K and 3K RAM in one package. This plugs into the rear expansion port of the computer. No re-addressing of existing BASIC programs is required. The cost is £44.95 and comes from Stonechip Electronics, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hants. Telephone 0252 318260.

Light Pen

An accurate colour light pen, this device can be pointed at the screen and tells the Vic 20 or the CBM 64 what it sees. Used instead of pressing keys the light pen can



be used to play a range of games produced by the same company. It can also write programs which allow the user to read what is on the TV screen or place images and words on the screen. £28.75. From Stack Computer Services Ltd, 290-298 Derby Road, Bootle, Liverpool.

Lightpen

The Datapen light pen is compatible with the VIC 20 and costs £25. The pen has an LED readout indicating that data is ready and a switch that allows the operator to signal when the position is right. From Datapen Microtechnology Limited, Kingsclere Road, Overton, Hants. RG25 3JB. Telephone: 0256 770488.

CHRISTMAS GIFTS

ANTISTATIC WIPES AND SPRAYS

Wipes and sprays can be used to eliminate static electricity and reduce the effect of dust on the screen and operator fatigue. Spray per bottle: £4.40 and 50 wipes per pack: £7.60. From Cambra and available from Vicsoft. Telephone: 0753 73638.

Head Cleaning Diskettes

A cleaning kit containing two diskettes and a bottle of fluid is enough for 30 cleaning operations. These 3M cleaning diskettes remove contamination from the read/write heads. Suitable for single or double sided drives. For 5¼ inch: £21.00 and 8 inch: £23.00. Available from Stralfors Data Products, Unit 11, Techno Trading Estate, Bramble Road, Swindon. Telephone: 0793 37837.

Cassette Head Cleaner

A non-abrasive tape head cleaner which helps to keep the cassette unit clean. It can be loaded into the cassette unit and played. 99p. Made by Cambra and available from Vicsoft. Telephone: 0753 73638.

Extension Lead

A 12 foot long extension lead which can be attached to a joystick to lengthen it and give the player more freedom. £7.95. From Silica Shop Ltd, Dept ZPCW 0883, 1-4 The Mews, Hatherley Road, Sidcup, Kent. Tel: 01-309 1111.

Furniture

An expansion console which gives the VIC the proffessional look and protects the micro and disc drives. All wiring is hidden out of sight and the console cost £39.99 from Silent Computers, 27 Wycombe Road, London N17 9XN

A series of workstations give enough storage space for printer, disk drive and micro. These have a starting price of £39.75 and come from International Data Automation Limited, 11 Station Parade, Virginia Water, Surrey GU25 4AB telephone 09904 4944.

Warranties

Astronics Limited are offering an extended warranty scheme for most home computers including the VIC and the 64. The cost of this service to the user is £25 for three years and £35 for five years. From Astronics Limited, Unit 2, Eastern Industrial Estate, Jackson Close, Cosham, Portsmouth, Hants. PO6 1QW. Telephone 0705 326 223.

The hygiene side of computing (see Cleaning Kits).

Cleaning Kits

An all-in-one cleaning kit comprises of disposable solvent appliers, wipes and cleaning cloths. There are also cleaners for the print wheel, buffer pads and sound shield. From ISA-GOLD, International Systems & Applications Limited, 80/84 Thornton Road, Bradford, West Yorkshire BD1 2DG. Telephone: 0274 306787.

The 64 Spreadsheet

An electronic spreadsheet that can solve problems. It is possible to simulate any calculation situation and then apply it to a variety of problems. It holds the figures, shows them on the screen and can be applied to any calculation formulae the user puts in. Features include printing the results on a bar chart or saving results on a disk or cassette. £25.00 on cassette and £27.50 on disk. Abrasco Ltd, The Grange Barn, Pikes End, Eastcote, Middlesex. Telephone: 01-866 2518.

Codewriter

A program which can be used to design a business information program in a language easy to understand – without programming. The user types in screen layouts and any calculations needed and the Codewriter will restructure them so that the computer can accept and use the information. Possible to write reports, print checks, letters etc. Comes on disk for the CBM 64. £85.00. Dynatech Software Ltd, rue du Commerce, Bouet, St Peter Port, Guernsey, C.I. Telephone: 0481 26081.

EPROM

A 4K byte EPROM which runs any BASIC or Machine Code program stored in ROM, eliminating the need for tape or disc. Compatible with the PET. The cost is £25 plus VAT and it is available from Greenwich Instruments Limited, 22 Bardsley Lane, Greenwich, London SE10 9RF. Telephone 01-853 0868.

Assembler Development

Enables the user to program in assembler directly on the CBM 64. Provides all the tools the assembler programmer needs in order to create, assemble, load, and execute the 6510 assembly language. Also included is a full machine code monitor and a DOS wedge. Available on disk. 24.95. By Commodore. Tel: 0753 79292.

EPROM

Uvipac allows up to three EPTOM's of any size or one CPU with an on-board EPROM to be erased in five to 10 minutes. Tis unit can be supplied with a 15 minute timer. On its own it costs £19.95 and with the timer £24.95. From Ground Control, Alfreda Avenue, Hullbridge, Essex SS5 6LT telephone 0702 230324.

Assembler

An assembler/disassembler for the 64 that comes on a tape. This tape lets you program using 6510/6502 mnemonics as easily as if it were BASIC. It is priced at £9.99 from Micro Power, BCM 8713, London WC1N 3XX.

Petspeed 64

A basic compiler allowing the user to speed up the execution of BASIC programs It can compile any program written in basic without any changes needed. These programs can shorten processing time, disk handling and even print runs. Comes on disk for the CBM 64. By Commodore and costs £50.00 tel: 0753 79292.

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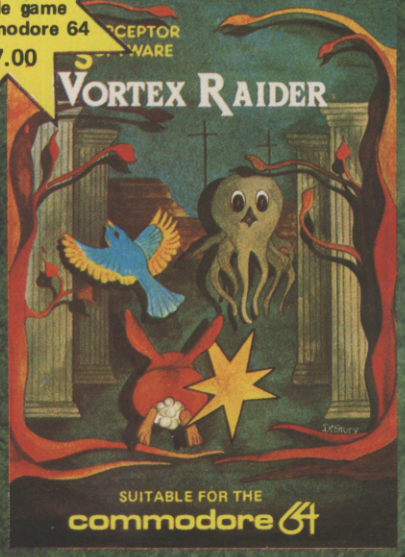

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A Mixed Marriage –

We never refuse a challenge! Here Owen Murcott explains how he became convinced that it would be possible to connect any two machines which use the 6522 VIA chip. He decided to attempt a connection between a Commodore machine and the BBC Micro. Here are the results of his experiments.

Being rather locked-in to Commodore, with a PET 2001, a 4032, two VICs, a CBM64, a 4040 and a 1541 disk drive, and a whole load of software for them, I didn't want to acquire another make. Besides, it would have been an expensive experiment to buy a Sirius, for example. However, the kindly Computing Studies master, at my son's school came to my rescue. He agreed to lend me a BBC micro for the 1983 August holidays, and so I was able to try my idea. This article describes the discoveries I made using this machine.

Lack of documentation

My first discovery was that a BBC user is more or less on his own as far as the user port is concerned. There are two pages in the BBC user guide with factual information about it. Two other pages do show a little bit of program which reads and writes to the data register. For handshaking, the guide refers the reader to "other books", without naming them. But this is no criticism – the VIC and 64 user guides contain nothing except the user port pin assignments!

The two factual pages are key pages:

* Page 437 User port register addresses;
* Page 503 A circuit diagram showing user port connections.

SHEILA

I attended my first programming course in the mid '60s. In it, the course members heard that program labels could be any set of characters. The less mature members of our trainee group immediately filled their programs with 'FRED' labels and 'SON-OF-FRED', etc. They soon realised with the rest of us that it helps if labels are meaningful in some way. It was saddening, now in the '80s, to discover the memory-mapped I/O area labelled 'SHEILA' in the BBC user guide! Trivial micro-computer handbooks are all too common nowadays, and even Commodore are not altogether blameless. Some of the 'jokes' are awful! I'm not sure that they improve understanding; most people I talk to find them an insult to their intelligence. But I'm riding a hobby-horse here, and it is not what the article is supposed to be about.

The two factual pages were invaluable. With them, and with the knowledge gleaned from previous experiments with my own machines, I did get the machines to communicate.

The Beeb's user port

There are five sets of connector pins set in a hollow on the underside of the machine. The centre set is the user port. It comprises a row of 10 pairs of pins.

I found that the user guide is ambiguous in the details in some diagrams. Different pages refer in different ways to the pins, and the diagram of external connections on page 499 does not appear to be drawn correctly. The only way I could be certain about the identity of the pins was to switch the machine on and use a test meter to identify first the two pins shown in the circuit diagram as +5V. These would be the only ones to show a reading. Connecting any other pins to ground would give 0V. In the absence of any unambiguous information, it seemed as good a way as any, and it worked! Having identified these two pins, I was able to deduce which way round the diagrams had been drawn.

Table 1 identifies the pins and gives

Commodore and BBC

you their usage. Look at the user port from the front of the machine, with the keyboard uppermost. I have assigned odd numbers to the bottom pins, and even numbers to the top row, working from left to right. Pin 1 is bottom left, pin 2 is top left, etc. The names show which registers are connected to the pins. You will see, as I said earlier, that they are identical with the registers used in the VIC. I have defined the connections to make to a Commodore user port, with letters for identification as used in Commodore's manuals. For completeness, I have also given the connections to make to another BBC micro should you wish to connect two together.

The Commodore end – a standard 12-position edge connector as described in the first article in the series;

The BBC end – a 20-way cable mounting socket of the insulation-displacing type. (I used RS Components Ltd. stock number 469-881. Stock number 467-289 is an alternative);

A length of colour-coded twisted pair ribbon cable with 10 pairs (RS stock number 358-056) suited to the cable mounting socket.

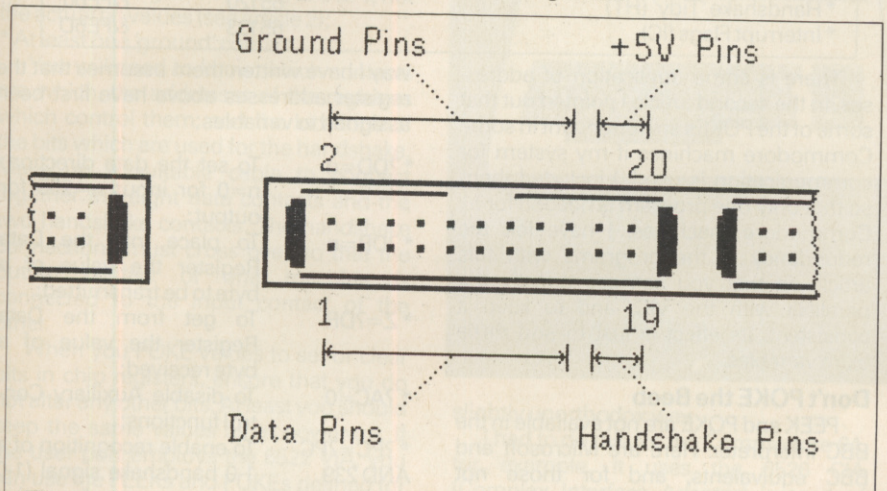

Fig 1 – BBC User Port (front view)

The connector

You will need the following materials to make the physical connection:

Making up the socket

In case you have not made up this type of connector before, here are some detailed instructions.

The ribbon cable which I have specified has 10 colour coded wires. Round each is twisted a tan-coloured common conductor. Every so often the twist stops, and there is a flat section to make it easy to

Pin	Name	Usage	Connect to CBM	BBC
1	PB7	Data	L	1
3	PB6	Data	K	3
5	PB5	Data	J	5
7	PB4	Data	H	7
9	PB3	Data	F	9
11	PB2	Data	E	11
13	PB1	Data	D	13
15	PB0	Data	C	15
17	CB2	Handshake out	B	19
19	CB1	Handshake in	M	17
2-16	OV	Ground	N	2-16
18-20	5V	Do not make any connection to these two pins		

Why should a magazine devoted to Commodore machines carry an article which digresses on to other hardware? This series is about how to connect different machines together and pass data between them.

On the whole, the number of differences between a PET and a CBM64 are about as many as the differences between the CBM64 and the BBC micro. And so are the number of similarities.

The BBC micro uses the 652 VIA chip to control its user port. The particular registers it uses in this chip are the same ones as used by the VIC; only their address are different. But the CBM64 doesn't even use the same chip. This, then, is my excuse – it's not much different from writing about a Commodore machine and it opens up a lot of possibilities.

Tell your friends

There is another benefit from this article. It gives you sufficient details to show you how to connect two BBC micros together. Not only that, it is probably the first time that the details of how to do it have been published. So tell your friends with BBC micros where to come for information.

The experiment

When starting to write these articles, and learning that other machines use the 6522 VIA chip to control a user port, I thought it would be interesting to experiement. Perhaps it wouldn't be so difficult to connect an alien to my PET through the user port.

mount a socket. Cut the ribbon halfway along a flat section, making a nice square edge. Part the rightmost two pairs from it, and cut their tan-coloured common conductors short by an inch or so, to make sure that they will not connect to the +5V pins. Follow them through, and cut them short at the other end, too.

Lay out the cable, with its end towards you, a coloured conductor leftmost (this will be connected to pin 1), and the two shortened common conductors on the right. You will see that the cable spacing is such that it mates with the grooves in the contacts on the socket housing. Slip the housing, face down, under the cable so that the cable is more or less flush with its edge. This edge will be the *underside* when it is plugged into the user port. Depending on the type of socket you have, watch out for any bumps which mate with slots surrounding the user port pins. Get it the right way round.

Push the locking clip onto its first locking point, making sure as you do so that the two loose coloured conductors lie in the same row of grooves as the other coloured conductors. When you are satisfied that the conductors are correctly seated, carefully use a vice to close up the locking clip to its second locking point. Fold the cable over the top, and press the strain relief clip into position to hold it.

Identify which colours relate to which pins. You can now solder the other end of the cable to the edge connector. Make the connections defined in Table 1. I actually only soldered four of the tan-coloured common conductors to pin N, and soldered the other four to pin 12 above it (also a ground pin) to give more room. Note that there should only be eight common conductors altogether arriving at the edge connector. Make sure that the other two are well out of the way.

Fix a protective cover in the way I described in the first article in this series. You will need to roll the ribbon connector before soldering the wires, so that it can emerge satisfactorily from the edge of this cover.

It may be that you intend to experiment with connecting two BBC micros together. In this case, make up the second end with a socket like the first; do it the same way. Don't forget that the two rightmost coloured conductors must be crossed over at this end, so that pin 17 of one connector is connected to pin 19 of the other. Otherwise the handshake will not work.

The registers and addresses

In the second article of this series I gave you the addresses of the interface chip registers appropriate to the various Commodore machines. There were also specific values which you had to poke to them.

The register addresses in the BBC micro are different, but the values to poke are the same as for the VIC. I have given the addresses in decimal and hexadecimal. Note the BBC convention, which uses ampersand (&) to identify hexadecimal rather than dollar ($) as used by Commodore.

Table 2

* Data Register (DR)	65120	&FE60
* Data Direction (DD)	65122	&FE62
* Auxiliary Control (AC)	65131	&FE6B
* Peripheral Control (PC)	65132	&FE6C
* Handshake Enable (HE)	65132	&FE6C
* Handshake Output (HS)	65132	&FE6C
* Handshake 'Tidy' (HT)	65120	&FE60
* Interrupt Flags (IC)	65133	&FE6D

There is some duplication of addresses. In the second article I pointed out that some of the POKEs are redundant in some Commodore machines if my system for communication is used. I included them so that only one program is needed for all Commodore machines. I have left the redundancy in the programs with this article so that you can see directly the parallels with the VIC, and to keep it consistent. Its effect is just to add three extra variables.

Don't POKE the Beeb

PEEK and POKE are not available in the BBC interpreter. Here are Microsoft and BBC equivalents, and for those not familiar with the BBC machine, an explanation:

POKE AC , 0 ? AC = 0

The use of the question mark in ?AC is interpreted as:

The contents of the byte at the memory location defined by the value of AC.

So ?AC=0 means let the byte at this address have the value zero. Similarly, Z=?HT means let Z have the value of the byte at the address HT. The Microsoft equivalent would be Z=PEEK(HT).

If you are familiar with Assembler, you will by now have recognised an indirect addressing mechanism. To have this facility in BASIC is most useful. In the BBC micro, it replaces PEEK and POKE.

Other BASIC differences

Commodore users will notice some slight differences in the use of DATA and GET. The BBC micro permits hexadecimal notation for values assigned to numeric variables. I have put the register addresses in the DATA statements in hexadecimal, to be consistent with the 'SHEILA' offset address given on page 437 of the user guide.

Z$ = GET$ is the valid BBC form of Microsoft's GET Z$.

Register values

The second article in this series gave you a detailed description of the register addresses for Commodore machines, and the values to be poked to them. Here, I have assumed that you saw the article, so have only summarised them for the BBC micro, in the same sequence in which they were presented in that article. The way I have written them assumes that the register addresses above have first been assigned to variables:

* ?DD=n	To set the data direction: n=0 for input n=255 for output;
* ?DR=n	To place into the Data Register the value of a byte to be transmitted;
* Z=?DR	To get from the Data Register the value of a byte received;
* ?AC=0	To disable Auxiliary Control functions;
* ?PC=?PC AND 239	To enable recognition of a 1-0 handshake signal (1-0 is known as a "negative transition");
* ?HE=?HE OR 2	To enable handshake signals to be sent;
* ?HS=?HS AND 223	To send handshake signal 0;
* ?HS=?HS OR 224	To send handshake signal 1;
* Z=?HT	To ensure that the handshake bit is clear before transmission starts. (The value of Z is irrelevant);
* H=?IC AND 16	To test whether a handshake signal has been received yet. If it has not, H is zero.

Two specimen programs

So that you have something to try, I have given a BBC version of two of my previous programs:

* KEYBOARD CONNECTOR from the second article in the series;
* HANDSHAKER from the third.

The programs are direct copies, laid out in the same way as before. I have made no attempt to use the program structuring capabilities of BBC BASIC. So you can make a direct comparison with

the previous versions, and no further explanation is necessary.

Connecting other machines

Previous articles of mine showed you how to connect any two of PET/VIC/CBM64 through their user ports. In this article I have used the same principles, but modified, to connect any Commodore machine to the BBC micro. By doing this I have really pointed the way for you to connect any other make. The only constraint is that it should have an addressable user port with:

* 8 data contacts;
* 2 handshake contacts. Preferably, the input contact should be 'edge-sensitive' to minimise programming. That is, it should detect the *change* from 1 to 0, or 0 to 1, not the actual bit values (see article 2);
* At least one 'ground' contact.

You will need to know which contacts are which, the addresses of the registers which control them, and the locations of the bits which are used for the handshake. Make up a suitable cable to connect together the eight data contacts and the two handshake contacts. The handshake connections must cross over so that the output contact of one machine is connected to the input contact of the other.

When you POKE values to set or clear bits in chip registers, ensure that you do not alter any other bits. At least you should keep the same values as at power-up. If the user port employs the 6522 VIA, you can use the PEEKs and POKEs defined for PETs and VICs in this series, provided that the same registers and bits are used. If it is not the same chip, you will certainly need to acquire a memory map and details of the register assignments of the chip used. You may also have to use the registers in a slightly unorthodox way.

I had to do this for the Commodore 64, for example. It uses the 6526 CIA (Complex Interface Adapter) instead of the 6522 VIA. If you look at a memory map for it, you will see that my 'Handshake Enable' register is, in fact, Data Direction Register A, and the handshake output line is named PA2 – a bit in Data Register A. But using this register meant that I could use the same pins on the Commodore 64 user port connector as on the PET and the VIC. Thus one connector works for any machine.

You need to choose your handshake convention, i.e. 'negative transition' or 'positive transition' which I defined in article 2. Take note of the reasons I gave in that article for choosing a negative transition.

```
 10 REM          HANDSHAKER - BBC MICRO                  W.OWEN MURCOTT  AUGUST 1983
 11 REM-------------------------------------------------------------------------------
 20 REM                                                  REGISTER ADDRESSES AND VALUES
 21 :
 30 DATA &FE60,&FE62,&FE6B,&FE6C,&FE6C,&FE6C,&FE60,&FE6D,239,224,224,223,16
 52 REM-------------------------------------------------------------------------------
 70 READ DR,DD,AC,PC,HE,HS,HT,IC: REM                   SET UP REGISTER ADDRESSES
 80 READ K1,K2,K3,K4,K5: REM                              SET UP REGISTER VALUES
 81 REM -----------------------------------------------------------------------------
 90 ?AC = 0: REM                                 DISABLE AUXILIARY CONTROL FUNCTIONS
 91 ?PC = ?PC AND K1: REM                        SET HANDSHAKE = 1-0
 92 ?HE = ?HE or K2: REM                         ENABLE HANDSHAKE
 93 Z = ?HT: REM                                 ENSURE HANDSHAKE BIT IS CLEAR
 94 ?HS = ?HS OR K3: REM                         SEND FIRST HANDSHAKE = 1
 95 REM-------------------------------------------------------------------------------
100 H0 = ?HS AND K4: REM                                 READY TO SEND HANDSHAKE = 0
110 IF (?IC AND K5) THEN PRINT "LOSER": END: REM                OTHER HAS SIGNALLED
120 Z$ = GET$: IF Z$="" GOTO 110
130 ?HS = H0: H = ?IC: REM                       SEND SIGNAL AND CHECK OTHER MACHINE
140 IF (H AND K5) THEN PRINT "LOSER": END
150 PRINT "WINNER"
```

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```
 10 REM       KEYBOARD CONNECTOR - BBC MICRO          W.OWEN MURCOTT  AUGUST 1983
 11 REM-------------------------------------------------------------------------------
 20 REM                                              'VIA' REGISTER ADDRESS AND VALUES
 21 :
 30 DATA &FE60, &FE62, &FE6B, &FE6C, &FE6C, &FE6C, &FE60, &FE6D
 31 DATA 239, 224, 224, 223, 16
 32 REM-------------------------------------------------------------------------------
 70 REM                                                  SET UP REGISTER ADDRESSES
 71 READ DR: REM                          DATA REGISTER
 72 READ DD: REM                          DATA DIRECTION
 73 READ AC: REM                          AUXILIARY CONTROL
 74 READ PC: REM                          PERIPHERAL CONTROL
 75 READ HE: REM                          HANDSHAKE ENABLE
 76 READ HS: REM                          HANDSHAKE OUTPUT
 77 READ HT: REM                          HANDSHAKE 'TIDY'
 78 READ IC: REM                          INTERRUPT FLAGS
 80 REM                                                  SET UP REGISTER VALUES
 81 READ K1: REM                          TO DEFINE 1-0 HANDSHAKE
 82 READ K2: REM                          TO ENABLE HANDSHAKE TO BE SENT
 83 READ K3: REM                          TO SET HANDSHAKE=1
 84 READ K4: REM                          TO SET HANDSHAKE=0
 85 READ K5: REM                          TO .TEST HANDSHAKE RECEIVED
 86 REM-------------------------------------------------------------------------------
 90 ?AC = 0: REM                          DISABLE AUXILIARY CONTROL FUNCTIONS
 91 ?PC = ?PC AND K1: REM                 SET HANDSHAKE = 1-0
 92 ?HE = ?HE OR K2: REM                  ENABLE HANDSHAKE
 93 Z = ?HT: REM                          ENSURE HANDSHAKE BIT IS CLEAR
 94 ?HS = ?HS OR K3: REM                  SEND FIRST HANDSHAKE = 1
 95 REM-------------------------------------------------------------------------------
100 PRINT "PRESS R=RECEIVE S=SEND"
101 Z$ = GET$
102 IF Z$ = "R" THEN ?DD = 0: GOTO 300: REM          DATA DIRECTION = IN
103 IF Z$ = "S" THEN ?DD = 255: GOTO 200: REM        DATA DIRECTION = OUT
104 GOTO 101
105 REM-------------------------------------------------------------------------------
200 PRINT "PRESS RETURN TO END"
210 Z$ = GET$: IF Z$="" GOTO 210
220 GOSUB 1000: REM                                  WAIT 'READY TO RECEIVE'
230 ?DR = ASC(Z$): REM                               SEND CHARACTER
240 GOSUB 2000:REM                                   SEND 'CHARACTER SENT'
250 IF Z$ <> CHR$(13) GOTO 210
260 END
270 :
300 GOSUB 2000: REM                                  SEND 'READY TO RECEIVE'
310 GOSUB 1000: REM                                  WAIT 'CHARACTER SENT'
320 A = ?DR: REM                                     GET CHARACTER
330 IF A = 13 THEN PRINT: PRINT "END": END
340 PRINT CHR$(A);
350 GOTO 300
360 REM-------------------------------------------------------------------------------
1000 IF (?IC AND K5) = 0 GOTO 1000: REM              WAIT HANDSHAKE
1001 RETURN
1002 REM------------------------------------------------------------------------------
2000 ?HS = ?HS AND K4: REM                           SEND HANDSHAKE = 0
2001 ?HS = ?HS OR K3: REM                            SEND HANDSHAKE = 1
2002 RETURN
```

HINTS & TIPS

This month our selection of useful routines and tips for Commodore machines include a machine code append for the 64, a warning about disk id numbers and a solution to SAVE and LOAD troubles in programs that incorporate sprites.

Append

The first routine that we have for you this month is a machine code append routine for the 64. This is a very useful routine for those of you who have entered our loaders and wish to use them in conjunction with a main program.

The concept of Append is to string a program on cassette or disk onto the end of the program that is currently in memory. Usually when doing a load, the program loaded is done so over the top of the residing program thus wiping it out. What this routine does is to find the end of the original Basic program and load the next program from there onwards. Then the pointers in the new program are reset to continue on (otherwise they would point back into the original program).

This is nearly it except that the variable pointers are now pointing to within the current program. These have to be set to the end of the appended program by scanning through the lines until the end is found and then setting the pointers for variables to the first byte of free RAM after that. This must be after the two zero's to mark the end of the program.

It must be remember that the line numbers of the appended program are greater than any of the current program's, otherwise when listing the program after the append, the line numbers will suddenly drop back to the numbers of the appended program.

To call this routine, enter SYS49152"filename",dev. Where filename is the filename of the program that you wish to append and dev is the device number that the program is stored on.

```
READY.

B*
    PC  SR AC XR YR SP
.;803E  32 00 93 00 F6

.; C000  A9 00     LDA #$00
.; C002  85 0A     STA $0A
.; C004  20 D4 E1  JSR $E1D4
.; C007  A5 2D     LDA $2D
.; C009  38        SEC
.; C00A  E9 02     SBC #$02
.; C00C  AA        TAX
.; C00D  A5 2E     LDA $2E
.; C00F  E9 00     SBC #$00
.; C011  A8        TAY
.; C012  A5 0A     LDA $0A
.; C014  20 D5 FF  JSR $FFD5
.; C017  20 33 A5  JSR $A533
.; C01A  A5 2D     LDA $2D
.; C01C  A4 2E     LDY $2E
.; C01E  38        SEC
.; C01F  E9 02     SBC #$02
.; C021  85 57     STA $57
.; C023  98        TYA
.; C024  E9 00     SBC #$00
.; C026  85 58     STA $58
.; C028  A0 00     LDY #$00
.; C02A  B1 57     LDA ($57),Y
.; C02C  D0 1B     BNE $C049
.; C02E  C8        INY
.; C02F  B1 57     LDA ($57),Y
.; C031  D0 16     BNE $C049
.; C033  A5 57     LDA $57
.; C035  18        CLC
.; C036  69 02     ADC #$02
.; C038  85 2D     STA $2D
.; C03A  85 2F     STA $2F
.; C03C  85 31     STA $31
.; C03E  A5 58     LDA $58
.; C040  69 00     ADC #$00
.; C042  85 2E     STA $2E
.; C044  85 30     STA $30
.; C046  85 32     STA $32
.; C048  60        RTS
.; C049  A0 00     LDY #$00
.; C04B  B1 57     LDA ($57),Y
.; C04D  85 59     STA $59
.; C04F  C8        INY
.; C050  B1 57     LDA ($57),Y
.; C052  85 58     STA $58
.; C054  A5 59     LDA $59
.; C056  85 57     STA $57
.; C058  4C 28 C0  JMP $C028
```

```
10 I=49152:T=0
20 READA
30 IFA=-1THEN50
40 POKEI,A:I=I+1:T=T+A:GOTO20
50 IFT<>9910THENPRINT"■■■■■■■■■■DATA ERROR■":END
60 PRINT"■■■■■■■■■■DATA OK■■■"
70 PRINT"■■■USE SYS49152"CHR$(34)"FILENAME"CHR$(34)",DEV"
80 PRINT"■■■■TO APPEND FILENAME.■■"
90 END
100 DATA169,0,133,10,32,212,225
110 DATA165,45,56,233,2,170,165
120 DATA46,233,0,168,165,10,32
130 DATA213,255,32,51,165,165,45
140 DATA164,46,56,233,2,133,87
150 DATA152,233,0,133,88,160,0
160 DATA177,87,208,27,200,177,87
170 DATA208,22,165,87,24,105,2
180 DATA133,45,133,47,133,49,165
190 DATA88,105,0,133,46,133,48
200 DATA133,50,96,160,0,177,87
210 DATA133,89,200,177,87,133,88
220 DATA165,89,133,87,76,40,192,-1
READY.
```

Tape headers

We have had a few enquiries about the way that a tape header is stored on the tape and how it is stored when it reaches the machine. The information that we have here is specifically for the 64 but it might be so for the PET and the VIC.

When the computer is told to load a program, it reads the tape searching for the start of a file and when it has found one, it checks the filename. If this is correct, the load routine then loads the program. Now, at the point of found, the tape header is stored in the cassette buffer. This header consists of four items; the secondary address when saved (1 byte), the start address of loading (2 bytes lo-hi order), the end address of loading (2 bytes lo-hi order), and the actual file name.

So far this is all straightfoward. The thing that surprised us was that from here on, the tape buffer is not used, the program is then loaded directly into the memory that it was intended to go in to. Therefore, the tape header is still there even after the load has been completed.

We know more, but certain software companies would not be very happy if we made that knowledge public. Experiment and see what you find.

Tape SAVE and LOAD

This is an informative letter we received from a reader called Sid Phillips:

Recently I purchased a CBM 64 computer and was plagued by 'SAVE' and 'LOAD' troubles mostly when 'SPRITES' were incorporated in my programs.

With the aid of an oscilloscope the source was traced to interference from the Sprite Generator.

One way to eliminate this problem is to enter a statement as follows:-

POKE 53296,0:SAVE"program name"

This line turns 'off' the Sprite Enable Register located at 53296 ($D015 hex) and then makes the save to tape.

When loading a new program after running Sprites previously and the power has not been turned off, then load with the following entry:-

POKE 53269,0:LOAD"program name"

The poke disables all sprites and loading should go as planned.

Your magazine is a constant source of useful information, please express my thanks to all writers who have helped provide fascinating reading.

(Technical Ed: Thank you Mr Phillips for the useful information that you have sent us. Your thanks have been passed on.)

Disk's identity crisis

This is more of a warning to all of those users who own disk drives. We have found, from our own experiences, that the id number on disks is not just for us to use as an identifier. The computer also uses this id number for its own purposes. If you have a disk with a certain id and you do not initialise the drive before using another disk with the same id number, when the disk is written to, the BAM is updated.

If the disk has the same id number as the last one written to, the BAM stored will be used when writing. The BAM stands for Block Availability Map and it tells the DOS where on the disk there is free space. It should be obvious that if you writ to one disk whilst the other disks' BAM is stored, something might be overwritten and this could have disastrous results.

Old restoration

To finish off this month we have another machine code routine for the 64. As with the first part, this routine could easily be converted to work on the other Commodore machines.

This routine does the opposite of the NEW command in that it restores a Basic program when a new has been performed. The routine actually scans the Basic program to find the end of the first line and restores the pointer to that line.

All the pointers are then rechecked to each line and finally the same routine as the append routine is used to scan to the end of the program and set the variable pointers.

To call this routine:- type SYS49280.

```
READY.

B*
    PC  SR AC XR YR SP
.;803E 32 00 83 00 F6
.

.; C080  A5 2B     LDA $2B
.; C082  18        CLC
.; C083  69 04     ADC #$04
.; C085  85 57     STA $57
.; C087  A5 2C     LDA $2C
.; C089  69 00     ADC #$00
.; C08B  85 58     STA $58
.; C08D  A0 00     LDY #$00
.; C08F  B1 57     LDA ($57),Y
.; C091  F0 10     BEQ $C0A3
.; C093  A5 57     LDA $57
.; C095  18        CLC
.; C096  69 01     ADC #$01
.; C098  85 57     STA $57
.; C09A  A5 58     LDA $58
.; C09C  69 00     ADC #$00
.; C09E  85 58     STA $58
.; C0A0  4C 8F C0  JMP $C08F
.; C0A3  A5 57     LDA $57
.; C0A5  A0 00     LDY #$00
.; C0A7  18        CLC
.; C0A8  69 01     ADC #$01
.; C0AA  91 2B     STA ($2B),Y
.; C0AC  C8        INY
.; C0AD  A5 58     LDA $58
.; C0AF  69 00     ADC #$00
.; C0B1  91 2B     STA ($2B),Y
.; C0B3  20 33 A5  JSR $A533
.; C0B6  A5 2D     LDA $2D
.; C0B8  A4 2E     LDY $2E
.; C0BA  38        SEC
.; C0BB  E9 02     SBC #$02
.; C0BD  85 57     STA $57
.; C0BF  98        TYA
.; C0C0  E9 00     SBC #$00
.; C0C2  85 58     STA $58
.; C0C4  A0 00     LDY #$00
.; C0C6  B1 57     LDA ($57),Y
.; C0C8  D0 19     BNE $C0E3
.; C0CA  C8        INY
.; C0CB  B1 57     LDA ($57),Y
.; C0CD  D0 14     BNE $C0E3
.; C0CF  A5 57     LDA $57
.; C0D1  18        CLC
.; C0D2  69 02     ADC #$02
.; C0D4  85 2D     STA $2D
.; C0D6  85 2F     STA $2F
.; C0D8  85 31     STA $31
.; C0DA  A5 58     LDA $58
.; C0DC  85 2E     STA $2E
.; C0DE  85 30     STA $30
.; C0E0  85 32     STA $32
.; C0E2  60        RTS
.; C0E3  A0 00     LDY #$00
.; C0E5  B1 57     LDA ($57),Y
.; C0E7  85 59     STA $59
.; C0E9  C8        INY
.; C0EA  B1 57     LDA ($57),Y
.; C0EC  85 58     STA $58
.; C0EE  A5 59     LDA $59
.; C0F0  85 57     STA $57
.; C0F2  4C C4 C0  JMP $C0C4
.
```

HINTS & TIPS

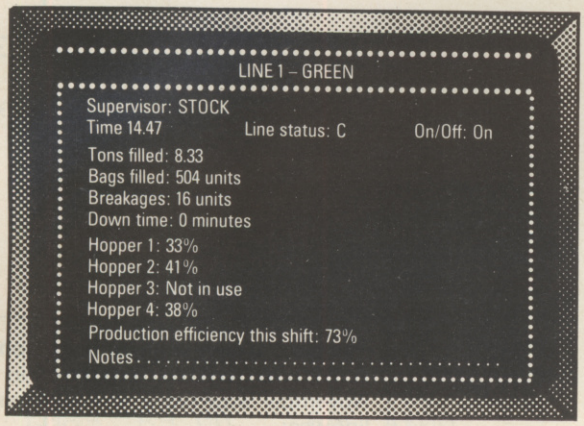
```
10 I=49280:T=0
20 READA
30 IFA=-1THEN50
40 POKEI,A:I=I+1:T=T+A:GOTO20
50 IFT<>12062THENPRINT"■■■■■■■■■■■DATA ERROR■":END
60 PRINT"■■■■■■■■■■■■DATA OK■■■"
70 PRINT"■■■■USE SYS49280 TO RESTORE PROGRAM"
80 NEW
100 DATA165,43,24,105,4,133,87
110 DATA165,44,105,0,133,88,160
120 DATA0,177,87,240,16,165,87
130 DATA24,105,1,133,87,165,88
140 DATA105,0,133,88,76,143,192
150 DATA165,87,160,0,24,105,1
160 DATA145,43,200,165,88,105,0
170 DATA145,43,32,51,165,165,45
180 DATA164,46,56,233,2,133,87
190 DATA152,233,0,133,88,160,0
200 DATA177,87,208,25,200,177,87
210 DATA208,20,165,87,24,105,2
220 DATA133,45,133,47,133,49,165
230 DATA88,133,46,133,48,133,50
240 DATA96,160,0,177,87,133,89
250 DATA200,177,87,133,88,165,89
260 DATA133,87,76,196,192,-1
READY.
```

The slip of a scalpel cut out a line from our Adventure Games program in the November issue (Vol 2 no 7). The missing line was:

```
9000 IFRND(1)>0.07THENRETURN
```

```
■ - By pressing the cursor down key
■ - By pressing the cursor down key with the shift key
■ - By pressing the cursor right key
■ - By pressing the cursor right key with the shift key
■ - By pressing the home key
■ - By pressing the home key with the shift key
■ - By pressing the control key and key 1
■ -                               key 2
■ -                               key 3
■ -                               key 4
■ -                               key 5
■ -                               key 6
■ -                               key 7
■ -                               key 8
■ - By pressing the CBM key with  key 1
■ -                               key 2
■ -                               key 3   ■ - By pressing key F1
■ -                               key 4   ■ - By pressing key F2
■ -                               key 5   ■ - By pressing key F3
■ -                               key 6   ■ - By pressing key F4
■ -                               key 7   ■ - By pressing key F5
■ -                               key 8   ■ - By pressing key F6
■ - By pressing the control key and key 9   ■ - By pressing key F7
■ -                               key 0   ■ - By pressing key F8
```

Hundreds of problems. One solution.



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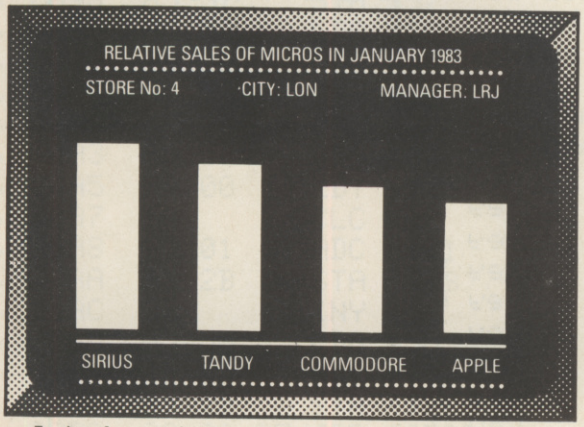

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LETTERS

Errors in programs published in magazines seem to be the biggest single complaint that readers have against computer magazines. Unfortunately for us, all computer magazines tend to get lumped together. This is a shame because we're not like the others.

All our programs are tested on our own Commodore machines here in the office and then printed out. We use the printout as artwork leaving very little margin for error. We hate to admit it but it is almost (but not quite) inevitable that the odd error will creep in. We will continue to strive for perfection, of course.

Our experience has shown that the vast majority of complaints we receive are the result of a mistake on the part of the programmer. And this is almost always the result of the failure to understand the cursor characters on the Commodore machines.

In future we will do our best to explain everything as clearly as possible. Meanwhile we would refer readers back to the User Manual.

The following letters are typical of the many we receive.

Dear Sir,

As a relative newcomer to the world of home computing, a step which I may have taken much too late in life, I am finding it somewhat difficult to do my own programming. I feel sure there must be others like me who, as a result, have relied upon the skills of those more capable. In doing so, I have tried, many times to type in printed programs from the many magazines on the subject.

To date I have failed miserably to get any such effort to work without fault on my Commodore 64. In the main, the programs are so badly printed often on poor quality paper, that one has extreme difficulty in deciphering the graphics, or they are so badly constructed that they need correction. This leads me to believe that the producers of these magazines are doing an injustice to the home computer market and, rather than being an encouragement to the expansion, are a deterrent.

I know I am generalising but as I have yet to come across such a program that I can type in and RUN without a mistake occurring I think I am entitled to generalise! For the time being at least.

Ken Whiteley
Hemel Hempstead,
Herts.

We could find no better reply to Ken Whiteley's letter, and those others who might agree with him, than to publish the following letter from one of our many North American readers. This letter was also sent to the editors of Computer, Compute Gazette and Computing Now.

Dear Sir,

This letter is an expression of puzzlement or, more precisely, an expression of bewildered disbelief.

With the reasonable expectation of any consumer, I bought your magazine in the belief that it contained material which fulfilled its purpose. However you seem to be satisfied to market a product which, in some instances, is a deception. I refer specifically to some of the computer programs that you print.

I fail to understand how producers of a technical magazine can justify errors, repeated errors, in that area of technology which is presumably their specialty.

If you print a computer program which, because of errors in the program, does not work, then that must mean that you did not verify the program by running it through a computer. Inasmuch as you print the program with restriction as to its use in a particular computer, then it should work in that computer. But some of your programs designated suitable for the Commodore 64, do NOT work in our Commodore 64.

It seems to me that that is comparable to an automobile accessories manufacturer stipulating that a product is for use on a certain make and model of car and, if the consumer finds that it is not usable on that make and model of car, then the REPUTABLE manufacturer will, in the normal course of events, refund the cost of the product and withdraw it from sale.

In magazine publishing speculative or experimental material, one should expect divergent views and subsequent revisions, but certainly one should not expect, AS A REGULAR PROCEDURE, corrections to be made in a technical magazine on computers.

"... as a regular procedure ...". Two of the magazines addressed in this letter have columns devoted to corrections of errors made in programs published in a previous issue. A third magazine refers the computer to line 5140 of the program, when, in fact, the last line of the program is 1810. Could that program have been verified in a computer before being published?

The fourth magazine *Commodore Computing International* seems to publish verified programs because we have found no errors in the programs used.

In conclusion, I await a refund of two dollars and seventy-five cents ($2.75) from *Computing Now*, Electronics Today International; a refund of three dollars and fifty cents ($3.50) from *Compute Gazette*, Compute Publications Inc; a refund of three dollars and twenty-five cents ($3.25) from *Compute*, Compute Publications Inc.

Inasmuch as the editors of three of the four magazines bought seem to assume that technical data is expected to be erroneous, I have included reference to the fourth magazine, *Commodore Computing International*, for the edification of those editors and as a commendation to the editor of the one magazine which seems to be published in a spirit of technical and financial honesty.

Leslie E Murphy
Montreal,
Canada.

Needless to say this is the sort of letter we love to read!

Dear Sir,

One of our customers, Stephen Gray, has written to us with a list of scores he has achieved whilst playing our PET arcade games. To our knowledge they are records, but it may be that some of your readers will dispute this.

GAME	SCORE
ASTEROIDS	8740
ASTEROIDS 2	20340
COSMIC ALIENS	150000
CRAZY KONG	53500
SUPER GLOOPER	108960
METEORITES	156940
PET PANIC	10390
SCRAMBLE	194860
BLAKATAK	117000
TANK ZONE	12230

I would be most grateful if you could publish this list and invite readers to contact you if they have recorded higher scores.

Peter Calver
Supersoft,
Harrow,
Middx.

THE ADDRESS TO WRITE TO IS:
QUERIES, Commodore Computing International,
167-169 Great Portland Street, London W1.
THE TELEPHONE NUMBER TO CALL IS:
01-636 6531 (remember – Thursday afternoons, 2 pm till 5 pm)

TELEPHONE ENQUIRIES
If you are really desparate for an answer and feel you really cannot wait for a published reply you can use our telephone enquiry service. We will have two of our staff standing-by every Thursday afternoon between 2 pm and 5 pm. That's when we want to hear from you.

CHARGET – the miraculous routine

When the command RUN is typed on the screen followed by a carriage return the operating system interprets this as a direct command and searches through its list of reserved words to find the address of the subroutine to perform this command. The RUN subroutine is located at address C775 its first functions are to set all the pointers to the start of the program, above all active 1/0 channels and restore all subroutine and data pointers.

Having done this, the first line of the Basic program is fetched using a subroutine located in page zero of memory, the command is executed and the next line fetched wtih the line fetch subroutine checking for spaces and more than one command on a line. This line fetch subroutine in page zero is of great interest since it opens up the possibility of adding additional commands to Basic.

For this reason it is worth looking at this subroutine closely, it is loaded into memory from locations 194 to 217 during system initialisation by a subroutine located at 57525.

The reason why this subroutine is relocated from ROM to RAM is that it requires a variable load address which points to the currents byte of Basic program text being accessed. This variable load address or pointer to source text is stored in locations 201 and 202 and the first function of the subroutine is to increment this pointer to point to the next location which is then read and stored in the processors accumulator. The remainder of the subroutine checks to see if the character obtained is either a colon, indicating the end of a statement, or a space if it is a space then the next is obtained.

The subroutine is as follows:

```
002   CHAR   E6  77    INC Z   C9    :increment character pointer
                                       low byte
             D0  02    BNE     02    :test if low byte =255 if true
                                       then

             E6  78    INC Z   CA    :increment character pointer
                                       high byte
       GET   AD ** ** LDA    ****   :get character from address in
                                       201 and 202
             C9 3A     CMP IMM  3A   :is character a colon
             B0 0A     BCS END       :if so go to END
             C9 20     CMP IMM  20   :is character a space
             F0 EF     BEQ CHAR      :if so go to CHAR
             38        SEC
             E9 30     SBC  30
             38        SEC
```

```
        E9 D0     SBC  D0
END     60        RTS          :return from subroutine to main
                                program
```

(the asterisks are used to show that the contents of these two bytes 201 and 202 are variable).

By inserting extra code into this subroutine by replacing the first six bytes with a couple of jump to subroutine instructions each Basic command can be intercepted before it is peformed. The first subroutine would be the main block of new code to perform whatever function we want to add to the PETs commands the second subroutine performs the function of the six bytes replaced by the two JSR instructions.

Thus if our new program starts at location 1A00 hex then the following six bytes could be inserted into the CHARGOT area:

```
00C2    CHARGOT    20 00 1A   JSR 1A00    :main subroutine



                   20 00 1F   JSR 1F00    :updte pointer subroutine
        GET        AD ** **   LDA ****
The subroutine at 1F00 would be:
1F00    POINTER    E6 77      INC Z C9    :increment pointer 201 (low
byte)
                   D0 02      BNE 02       :if low byte = 255 then
increment
                                          202
                   E6 78      INC Z CA    :pointer 202 (high byte)
        END        60         RTS         :return to main program
```

An easy way of detecting new commands is to procede them by a particular character such as the dollar sign then just use a small subroutine to detect if the first character in a command is a dollar sign if it is then that command is executed by the new software rather than the existing interpreter. Thus for example a graph plotting command could be added to plot a point on the screen using double density graphics (see the program for this in the section on the video display) with a command like SPLOT X,Y where X and Y are the X and Y co-ordinate values.

The range of commands is very large and includes functions like the example just given and commands governing the operation of peripherals such as A/D converters, or disk units. The ability to intercept each command before it is executed need not only be applied to adding extra commands to Basic it can also be used to monitor the execution of a program. This allows one to construct a very powerful diagnostic aid known as a trace program this slows down the running of a Basic program and displays each line on the screen as it is executed.

16 defined function keys

In this month's section we have a useful program for the 64 which defines the function keys of the 64, a game called frog for the 40 column PET's, one game for the unexpanded VIC, and one game that will work on all machines.

```
1 REM * SAVE PROGRAM BEFORE RUNNING *
2 REM ***********************************
3 REM *                                 *
4 REM *    DEFINED KEYS FOR CBM 64      *
5 REM *                                 *
6 REM *    D & J.GARDINER  29.8.83      *
7 REM *                                 *
8 REM ***********************************
9 REM
10 REM ***********************************
11 REM *                                 *
12 REM *  DO NOT TYPE REMS ABOVE 82      *
13 REM *                                 *
14 REM ***********************************
15 FORI=38600TO38719:READD$
16 H=ASC(LEFT$(D$,1))-48:IFH>9THENH=H-7
17 E=ASC(RIGHT$(D$,1))-48:IFE>9THENE=E-7
18 D=H*16+E:POKEI,D:NEXT
19 DATA78,A9,DC,8D,14,03,A9,96
20 DATA8D,15,03,58,85,38,A9,00
21 DATA85,37,60,EA,EA,48,8A,48
22 DATA98,48,A5,C5,C5,FB,F0,4E
23 DATA85,FB,EA,A2,00,AD,8D,02
24 DATAA8,C0,00,F0,09,8A,18,69
25 DATA20,AA,88,18,90,F3,E0,60
26 DATA30,02,A2,60,EA,EA,A5,C5
27 DATAA0,03,84,FE,C5,FE,F0,11
28 DATAC8,E8,E8,E8,E8,E8,E8,E8
29 DATAE8,C0,07,D0,ED,4C,36,97
30 DATAEA,8A,85,FC,A9,96,85,FD
31 DATAA0,00,B1,FC,99,77,02,C8
32 DATAC0,08,D0,F6,84,C6,68,A8
33 DATA68,AA,68,4C,31,EA,00,FF
34 FORX=0TO15:READN$
35 L=LEN(N$):IFL>8THENPRINTX;N$:PRINT"8 CHARACTERS MAXIMUM":END
36 FORY=1TO8
37 IFY>LTHENP=0:GOTO39
38 P=ASC(MID$(N$,Y,1)):IFP=95THENP=13
39 POKE38399+Y+X*8,P:NEXTY,X
40 PRINT"□ FUNCTION KEYS DEFINED":CLR
41 PRINT"■ PRESS RETURN TO ENABLE KEYS NOW □"
42 PRINT"■■SYS38600□□"
43 NEW
44 REM ------------------------------
45 REM   WITH SHIFT KEY NOT PRESSED
46 REM   F7   F1    F3     F5
47 REM
48 DATA"FOR","IF","GOTO","POKE"
49 REM ------------------------------
50 REM   WITH SHIFT KEY PRESSED
```

Define Keys

This is a very useful routine for the 64 which allows you to set the four function keys on the right of the keyboard to display complete words. A few months ago we published a routine to do this but we have decided that this program is so good that it must be printed.

There is a maximum of 8 characters allowed to be set to each key but the difference to the other routine is that the other routine only allowed shifted and unshifted function keys allowing only eight functions. With this routine, you still get the shifted and unshifted keys but in addition you can use the commodore key for another four functions and the control key for yet another four. This gives a total of 16 defined function keys.

The problem is set up with the machine code source in rems so that anybody wishing to understand the operation of this routine or even to get a few tips on 6502 programming may do so.

```
51 REM   F8     F2      F4     F6
52 REM
53 DATA"NEXT","THEN","GOSUB","PEEK("
54 REM ------------------------------
55 REM   WITH COMMODORE KEY PRESSED
56 REM   F7      F1       F3       F5
57 REM
58 DATA"STR$(","LEFT$(","MID$(","RIGHT$("
59 REM ------------------------------
60 REM   WITH C.T.R.L KEY PRESSED
61 REM   F7     F1     F3     F5
62 REM
63 DATA"LIST","LOAD","SAVE","RUN←"
64 REM ------------------------------
65 REM  BY CHANGING DATA IN LINES
66 REM
67 REM  48,53,58,63 FUNCTION KEYS CAN
68 REM
69 REM  BE ALTERED TO YOUR OWN CHOICE.
70 REM
71 REM  BY PLACING A LEFT ARROW ( ← )
72 REM
73 REM  AFTER THE COMMAND IT WILL
74 REM
75 REM  AUTOMATICALLY RETURN ITSELF.
76 REM
77 REM  E.G  RUN← WHEN PRESSED WILL
78 REM
79 REM  AUTOMATICALLY RUN WITHOUT YOU
80 REM
81 REM  HAVING TO PRESS RETURN.
82 REM ********************************
83 REM *                              *
84 REM *     PROGRAM EXPLANATION      *
85 REM *                              *
86 REM ********************************
87 REM THIS PROGRAM WORKS BY TAKING HEX
88 REM POKING INTO MEMORY AT 38600 UP.
89 REM THIS DATA FORMS A MACHINE CODE
90 REM SYS38600.
91 REM HITTING RUN/STOP & RESTORE KEYS
92 REM SYS38600 WILL TURN THE ROUTINE
93 REM THE COMMANDS ARE HELD AS DATA IN
94 REM THESE COMMANDS ARE COPIED INTO
95 REM CAN BE USED B THE MACHINE CODE
96 REM THE MACHINE CODE LOOKS LIKE THIS.
97 REM  96C8  SEI          TURNOFF IRQ.
98 REM  96C9  LDA #$DC    (SET UP
99 REM  96CB  STA $0314   (ADDRESS
100 REM 96CE  LDA #$90    (FOR NEW
101 REM 96D0  STA $0315   (IRQ JUMP.
102 REM 96D3  CLI          TURNON IRQ.
103 REM 96D4  STA $38     (LOWER TOP OF
104 REM 96D6  LDA #$00    (MEMORY TO
105 REM 96D8  STA $37     (PROTECT PROG.
106 REM 96DA  RTS          BASIC RETURN.
107 REM 96DB  NOP          NO OPERATION.
108 REM 96DC  NOP          START NEW IRQ.
109 REM 96DD  PHA         (SAVE ALL
110 REM 96DE  TXA         (REGISTERS
111 REM 96DF  PHA         (BY PUSHING
```

```
DATA, CONVERTING INTO DECIMAL &

ROUTINE WHICH IS CALLED BY

TURNS OFF THE ROUTINE.
BACK ON AGAIN.
LINES 48-63.
MEMORY AT 38400 UP , WHERE THEY
ROUTINE.
```

```
112 REM 96E0  TYA        (ONTO THE STACK
113 REM 96E1  PHA        (--------------
114 REM 96E2  LDA $C5    (GET LAST KEY
115 REM 96E4  CMP $FB    (PRESSED
116 REM 96E6  BEQ $9736  (IF NONE THEN
117 REM 96E8  STA $FB    (BRANCH $9736
118 REM 96EA  NOP         NO OPERATION.
119 REM 96EB  LDX #$00    SET X TO 00
120 REM 96ED  LDA $028D  (CHECK IF SHIFT
121 REM 96F0  TAY        (OR COMMODORE
122 REM 96F1  CPY #$00   (OR CTRL KEY
123 REM 96F3  BEQ $96FE  (PRESSED
124 REM 96F5  TXA        (IF SHIFT X=$20
125 REM 96F6  CLC        (IF COMM  X=$40
126 REM 96F7  ADC #$20   (IF CTRL  X=$80
127 REM 96F9  TAX        (
128 REM 96FA  DEY        (
129 REM 96FB  CLC        (
130 REM 96FC  BCC $96F1  (--------------
131 REM 96FE  CPX #$60   (IF X=$80
132 REM 9700  BMI $9704  (THEN X=$60
133 REM 9702  LDX #$60   (--------------
134 REM 9704  NOP         NO OPERATION
135 REM 9705  NOP         NO OPERATION
136 REM 9706  LDA $C5    (GET LAST KEY
137 REM 9708  LDY #$03   (PRESSED
138 REM 970A  STY $FE    (
139 REM 970C  CMP $FE    (IF F7 (Y=$03)
140 REM 970E  BEQ $9721  (THEN X=X+$00
141 REM 9710  INY        (
142 REM 9711  INX        (IF F1 (Y=$04)
143 REM 9712  INX        (THEN X=X+$08
144 REM 9713  INX        (
145 REM 9714  INX        (IF F3 (Y=$05)
146 REM 9715  INX        (THEN X=X+$10
147 REM 9716  INX        (
148 REM 9717  INX        (IF F5 (Y=$06)
149 REM 9718  INX        (THEN X=X+$18
150 REM 9719  CPY #$07   (
151 REM 971B  BNE $970A  (
152 REM 971D  JMP $9736  (--------------
153 REM 9720  NOP        (PUT X IN LOW
154 REM 9721  TXA        (BYTE & $96 IN
155 REM 9722  STA $FC    (HIGH BYTE FOR
156 REM 9724  LDA #$96   (DATA POINTER.
157 REM 9726  STA $FD    (--------------
158 REM 9728  LDY #$00     (READ DATA
159 REM 972A  LDA ($FC),Y (INTO KEY-
160 REM 972C  STA $0277,Y (BOARD BUFFER
161 REM 972F  INY          (FOR PRINTING
162 REM 9730  CPY #$08     (
163 REM 9732  BNE $972A    (
164 REM 9734  STY $C6      (------------
165 REM 9736  PLA        (GET Y,X & A
166 REM 9737  TAY        (REGISTER FROM
167 REM 9738  PLA        (ORIG VALUES ON
168 REM 9739  TAX        (THE STACK.
169 REM 973A  PLA        (--------------
170 REM 973B  JMP $EA31   JUMP TO NORMAL
171 REM 973E  BRK         IRQ ROUTINE
READY.
```

```
READY.

 0 GOSUB1300
 1 REM*****ROAD FROG*****
 2 O=20
 3 L=1
 4 MN=3:TI$="000000":W$="120"
 5 FORA=1TO5:P$(A)="":NEXTA
10 A(1)=1:A(2)=4:A(3)=4:A(4)=8
15 S1=33748
20 PRINT""
30 FORA=1TO20
40 A$=A$+" ▗▀▀▖  "
50 B$=B$+" ▝▀▀▘  "
55 REM
56 REM*****CAR GRAPHICS*****
57 REM
60 C$=C$+" ◆◆ ":D$=D$+" ◆◆ "
64 REM
65 REM*****SAFE ZONE    *****
67 REM
70 NEXTA
80 PRINT"TIME=";W$;"ROAD FROG";SC
81 PRINT"P$(1)"P$(2)"P$(3)"P$(4)"P$(5);
82 PRINT";"
83 PRINT"
85 IFVAL(TI$)>119THEN900
86 REM*****OUT OF TIME*****
87 REM*****PRINT CHARACTERS*****
```

Road Frog

Written for the PET 40 column machines, the object of this game is to get the frog (spade symbol) across the road without getting run over and move it into one of the five 'homes' at the top of the screen. You can not move into a home that already has a frog in it, and when all five homes are full, the game starts again. You score ten points for each frog home and there is a time limit of 120 seconds to get each frog home.

This game was written by Simon Goodyear.

```
88 REM
90 PRINTMID$(A$,A(1),39):PRINTMID$(B$,A(1),39):PRINT:PRINT
95 PRINTMID$(A$,A(2),39)
100 PRINTMID$(B$,A(2),39):PRINT:PRINT:PRINTLEFT$(C$,39):PRINTLEFT$(D$,39)
105 PRINT:PRINT
110 PRINTMID$(A$,A(3),39):PRINTMID$(B$,A(3),39):PRINT:PRINT
115 PRINTMID$(A$,A(4),39)
120 PRINTMID$(B$,A(4),39)
125 REM
126 REM*****MOVE CHARACTERS*****
127 REM
130 A(1)=A(1)+L:IFA(1)>8THENA(1)=1
140 A(2)=A(2)-L:IFA(2)<1THENA(2)=8
150 A(3)=A(3)+L:IFA(3)>8THENA(3)=1
160 A(4)=A(4)-L:IFA(4)<1THENA(4)=8
170 IFG$<>""THENX$=G$
171 W=120-VAL(TI$):W$=RIGHT$("  "+STR$(W),3):REM**COUNT-DOWN**
180 GETG$
181 S2=S1
182 REM
183 REM*****CURSOR CONTROLS*****
184 REM
185 IFG$=""THENG$=X$
190 IFG$="Z"ANDS1>32727ANDO>1THENS1=S1-2:O=O-2
200 IFG$="X"ANDS1<33766ANDO<38THENS1=S1+2:O=O+2
210 IFG$=":"ANDS1>32800THENS1=S1-80
220 IFG$=";"ANDS1<33727THENS1=S1+80
225 X=S1+40:U=PEEK(X):P=PEEK(S1)
232 IFS1<32806THENIFU=99ORU=65THEN500
235 IFPEEK(S1)<>32ANDPEEK(S1)<>73ANDPEEK(S1)<>85ANDPEEK(S1)<>65THEN550
237 POKES2,32
240 POKES1,65
250 GOTO80
300 G$="":X$="":O=20:S1=33748
305 REM
306 REM*****HOLES FULL*****
310 FORA=1TO5:IFP$(A)="¯"THEN80
320 NEXTA:GOTO800
400 REM
405 REM*****HOME ?*****
406 REM
500 IFS1<32779ANDP$(1)="¯"THENP$(1)="♠":GOSUB1200:GOTO300
510 IFS1<32786ANDS1>32779ANDP$(2)="¯"THENP$(2)="♠":GOSUB1200:GOTO300
520 IFS1<32793ANDS1>32786ANDP$(3)="¯"THENP$(3)="♠":GOSUB1200:GOTO300
530 IFS1<32800ANDS1>32793ANDP$(4)="¯"THENP$(4)="♠":GOSUB1200:GOTO300
540 IFP$(5)="¯"ANDS1>32800THENP$(5)="♠":GOSUB1200:GOTO300
541 GOTO1000
545 REM
546 REM*****HAVE YOU BEEN RUN OVER ?*****
550 MN=MN-1:IFMN<1THEN700
560 G$="":X$="":O=20:S1=33748:TI$="000000":W$="120"
570 PRINT"■■■SPLAT!YOU HAVE BEEN RUN OVER■":FORT=1TO500:NEXTT:GOTO80
700 PRINT"■■ALL YOUR MEN ARE DEAD! HARD LUCK":END
710 REM
720 REM*****HAVE YOU RUN OUT OF TIME ?*****
730 REM
800 FORA=1TO5:P$(A)="¯":NEXT:L=L+.4:TI$="000000":W$="120":S1=33748:O=20:GOTO80
900 PRINT"■ YOU HAVE RUN OUT OF TIME":FORT=1TO500:NEXTT
905 REM
906 REM*****FROG IN HOLE*****
907 REM
910 MN=MN-1:IFMN<1THEN700
920 G$="":X$="":O=20:S1=33748:TI$="000000":W$="120":GOTO80
1000 PRINT"■■■■■■■■■FROG IN HOLE■■■■■■■■■■■■■■HARD LUCK !!":FORI0=1TO1000:NEXT
```

```
 1010 G$="":X$="":O=20:S1=33748:TI$="000000":W$="120":GOTO80
 1199 END
 1200 SC=SC+10:TI$="000000":W$="120"
 1210 RETURN
 1299 END
 1300 PRINT"■"
 1305 REM
 1306 REM*****INSTRUCTIONS*****
 1307 REM
 1310 PRINT"■HI. I'M ROAD FROG.■"
 1340 PRINT
 1350 PRINT"■WHAT'S YOUR NAME ?■"
 1355 INPUT R$
 1356 PRINT"■WELL■";R$;" ■LET ME TELL YOU ABOUT MYSELF.■"
 1357 PRINT"■KEY TO CONTINUE."
 1359 GETG$:IFG$=""THEN1359
 1360 PRINT"■ALL YOU NEED TO DO IS CROSS THE ROAD    WITHOUT GETTING KNOCKED OVE
R"
 1365 PRINT"IT'S AS SIMPLE AS THAT !"
 1366 PRINT"■KEY TO CONTINUE."
 1367 GETG$:IFG$=""THEN1367
 1370 PRINT"■■HERE ARE THE CURSOR CONTROLS■"
 1380 PRINT
 1390 PRINT"'↑' ■IS THE FROG■"
 1391 PRINT"'Z' ■IS LEFT MOVE■"
 1392 PRINT"'X' ■IS RIGHT MOVE■"
 1393 PRINT"':' ■IS UP MOVE■"
 1394 PRINT"';' ■IS DOWN MOVE■"
 1395 PRINT
 1396 PRINT"WHEN MOVVING PRESS 'SPACE BAR' TO STOP":PRINT
 1397 PRINT"■YOU HAVE 3 LIVES. SO YOU NEED TO BE A   QUICK GUN TO STAY ALIVE.■"
 1398 PRINT"DON'T FORGET TO MOVE THROUGH THE BARRIERTO CROSS THE 2ND ROAD."
 1400 PRINT
 1410 PRINT"■HAVE FUN !■"
 1420 PRINT"■KEY TO START"
 1430 GETG$:IFG$=""THEN1430
 1440 RETURN
READY.
```

Shuffle

This is the game for the VIC-20. The idea of the game is to rearrange the numbers in a four by four grid so that they read sequentially:

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

The numbers can only be moved into the space and the space goes to where the number was.

This game will work on the unexpanded VIC-20 and all other commodore machines as well.

```
 130 GOSUB610
 140 PO$="■■■
```

```
310 T=B(I):B(I)=B(J):B(J)=T
320 PRINT"■":PRINT"■■";
330 FORI=1TO16STEP4:FORJ=0TO3:PRINTTAB(TB+J*5+2);
340 IFB(I+J)<16THENPRINT"■■"RIGHT$(STR$(B(I+J)),2);
350 NEXTJ:N=0:PRINT"■■■■":NEXTI:PRINTLEFT$(PO$,22);N;"MOVES"
360 GETZ$:IFZ$=""THEN360
370 IFZ$="8"THEN600
380 IFZ$<"2"ORZ$>"8"THEN360
390 IFVAL(Z$)AND1THEN360
400 ONVAL(Z$)/2GOTO470,450,430,410
410 T=BS+4:IFT>16THEN360
420 GOTO480
430 T=BS-1:IF(3ANDT)=0THEN360
440 GOTO480
450 T=BS+1:IF(3ANDBS)=0THEN360
460 GOTO480
470 T=BS-4:IFT<1THEN360
480 B(BS)=B(T):B(T)=16
490 I=INT((BS-1)/4):J=BS-I*4
500 PRINT"■■"LEFT$(PO$,I*4+5):PRINT"■■"TAB(TB+J*5-3)RIGHT$(STR$(B(BS)),2)
510 I=INT((T-1)/4):J=T-I*4
520 PRINT"■"LEFT$(PO$,I*4+5):PRINT"■■"TAB(TB+J*5-3)"  "
530 BS=T:N=N+1:PRINT"■"LEFT$(PO$,22);STR$(N);" MOVE";:IFN>1THENPRINT"S
540 PRINT"  ":IFBS<16THEN360
550 FORI=1TO16:IFB(I)<>ITHEN360
560 NEXTI:PRINT"■■"LEFT$(PO$,20);"CONGRATULATIONS":PRINT"■"N"MOVES"
570 PRINT"■ANOTHER GO ?";
580 GETI$:IFI$=""THEN580
590 IFI$="Y"THENRUN
600 POKE36879,27:PRINT"■■";:END
610 POKE36879,42:POKE36869,240
620 PRINT"■■***   VIC SHUFFLE  ***
630 PRINT"■YOU HAVE TOO REARANGE
640 PRINT" THE NUMBERS IN THEIR
650 PRINT" BOXES SO THAT THEY
660 PRINT" ARE IN CORRECT ORDER
670 PRINT"■THE CORRECT ORDER IS:
680 PRINT" 1  2  3  4
690 PRINT" 5  6  7  8.
700 PRINT" 9  10 11 12
710 PRINT" 13 14 15
720 PRINT"■YOU CAN ONLY MOVE THE
730 PRINT" NUMBERS INTO SPACES
740 PRINT" LEFT BY OTHER NUMBERS
750 PRINT"USE THE KEYS AS SHOWN
760 PRINT" FOR THE DIRECTIONS.
770 PRINT"■GOOD LUCK
775 PRINT"      ■KEY TO BEGIN";
780 GETA$:IFA$=""THEN780
790 PRINT"■":POKE36869,240:RETURN
READY.
```

```
10 REM FIND THE WORD
20 REM ****************************************
30 REM
40 S=1
50 P=0:POKE36879,42
60 T$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
70 DIMR$(8,8)
80 PRINT"■■*** FIND THE WORD ***"
90 PRINT"      DO YOU WANT          INSTRUCTIONS ?"
100 GETA$:IFA$=""THEN100
110 IFA$="Y"THENGOSUB1560
120 P=0:GOSUB220
```

Find The Word

The last program this month is also a game written for the unexpanded VIC-20. It will also, however, work on any other commodore machine as well. The game is a type of word search where there is only one word in the grid and you are allowed to choose the size of the word. As the game goes on, after a wrong guess, the computer will give you clues as to the word with consecutive letters in the word.

This can be modified with your own words if you so wish.

```
130 GOSUB370
140 GOSUB450
150 GOSUB850
160 GOSUB950
170 IFO=0THENGOTO150
180 GOSUB1310
190 IFO=0THENGOTO1430
200 GOSUB1260
210 GOTO120
220 PRINT
230 PRINT"■HOW HARD DO YOU WANT"
240 PRINT"■IT TO BE ? (1/2)"
250 GETA$:IFA$=""THEN250
260 M=VAL(A$)
270 IFM<1THENGOTO220
280 IFM>2THENGOTO220
290 PRINT
300 PRINT"■■HOW LONG IS THE WORD"
310 PRINT"LENGHT ? (3 TO 6)
320 GETA$:IFA$=""THEN320
330 L=VAL(A$):IFL<3THEN290
340 IFL>6THEN290
350 N=L+1
360 RETURN
370 RESTORE
380 READA$
390 IFLEN(A$)<>LTHENGOTO380
400 Q=RND(7)*15+1
410 FORX=1TOQ
420 READW$
430 NEXTX
440 RETURN
450 X=0
460 R=INT(RND(1)*N+1)
470 K=INT(RND(1)*N+1)
480 IFR<=2ORR>=N-1THENGOTO520
490 IFK<=2ORK>=N-1THENGOTO520
500 X=X+1
510 GOTO460
520 FORX=1TON
530 FORY=1TON
540 Q=INT(RND(1)*26+1)
550 Q$=MID$(T$,Q,1)
560 R$(X,Y)=Q$
570 NEXTY
580 NEXTX
590 IFM=2THENGOTO750
600 IFR<=2ORR>=N-1THENGOTO680
610 IFK<=2THENKR=1
620 IFK>=N-1THENKR=-1
630 FORX=1TOLEN(W$)
640 R$(K,R)=MID$(W$,X,1)
650 K=K+KR
660 NEXTX
670 RETURN
680 IFR<=2THENRR=1
690 IFR>=N-1THENRR=-1
700 FORX=1TOLEN(W$)
710 R$(K,R)=MID$(W$,X,1)
720 R=R+RR
730 NEXTX
740 RETURN
750 IFR<=2THENRR=1
760 IFR>=N-1THENRR=-1
770 IFK<=2THENKR=1
780 IFK>=N-1THENKR=-1
790 FORX=1TOLEN(W$)
800 R$(K,R)=MID$(W$,X,1)
810 K=K+KR
820 R=R+RR
830 NEXTX
840 RETURN
850 PRINT"■■==================
860 FORX=1TON:PRINT"    ";
870 FORY=1TON
880 PRINTR$(X,Y);" ";
890 NEXTY
900 PRINT
910 NEXTX
920 PRINT"==================■
930 PRINT"■LENGTH=";L
940 RETURN
950 PRINT"■WHAT IS THE WORD ?
960 INPUTA$
970 P=P+1
980 IFA$=W$THENGOTO1180
```

```
990 PRINT"■SORRY ■■WRONG■■"
1000 IF(P-2)=LTHENGOTO1120
1010 IFP>2THENGOTO1050
1020 PRINT"■NOT VERY GOOD"
1030 O=0:FORKK=1TO3000:NEXT
1040 RETURN
1050 H$=LEFT$(W$,P-2)
1060 PRINT"■YOU NEED HELP."
1070 IFP>3THEN1100
1080 PRINT"■THE FIRST LETTER IS":PRINTH$
1090 GOTO1030
1100 PRINT"■THE FIRST";P-2;"LETTERS":PRINT"ARE  ";H$
1110 GOTO1030
1120 PRINT"■WRONG, YOU DID":PRINT"NOT GET THE WORD
1130 PRINT"RIGHT.
1140 PRINT"■IT WAS ■■";W$"■
1150 FORI=1TO3000:NEXT
1160 O=-1
1170 RETURN
1180 PRINT
1190 PRINT"■■THAT IS IT
1200 PRINT"■YOU GOT IT IN"P
1210 PRINT"TRY"
1220 IFP>1THENPRINT"■TRIES"
1230 FORI=1TO3000:NEXT
1240 O=1
1250 RETURN
1260 S=S+1
1270 RR=0
1280 KR=0
1290 P=0
1300 RETURN
1310 PRINT
1320 T=T+(L/P)*(L/P)*M
1330 PRINT"■THE SCORE FOR THIS":PRINT"WORD:";INT((L/P)*(L/P)*M)
1340 PRINT"■(MAXIMUM SCORE":PRINT"WAS";INT(L*L*M);"■)"
1350 PRINT"■TOTAL SCORE"INT(T/S)
1360 PRINT"■■ANOTHER GO ?
1370 GETA$:IFA$=""THEN1370
1380 PRINT
1390 IFA$="Y"THEN120
1400 IFA$="N"THEN1430
1410 PRINT"■Y OR N PLEASE■■"
1420 GOTO1370
1430 PRINT"■■";:POKE36879,27:END
1440 DATA333,TIN,GET,THE,SIT,CAT,DOG,ONE,TWO
1450 DATASIX,TEN,FIT,BET,SET,BIG,BAD
1460 DATA4444,FOUR,FIVE,COOL,MAKE,HOLE,POSH
1470 DATANINE,CLAP,COLD,GOOD,YOUR,WHAT,READ
1480 DATAVAST,LAMP,DEUL
1490 DATA55555,CHIPS,GREAT,CLEAR,GLASS,MAKER
1500 DATASPOOL,SLEEP,BEAST,THREE,SEVEN,STOOL
1510 DATAEIGHT,PLANT,RADAR,RADIO,WATER
1520 DATA666666,ARCTIC,GUITAR,MINUTE,MIDDLE
1530 DATAPISTOL,ANIMAL,TOWERS,PERMIT,FIRING
1540 DATADRAGON,ROBOTS,ROCKET,MOSAIC,MEMORY
1550 DATABANDIT
1560 PRINT"■INSTRUCTIONS:
1570 PRINT"■FIND THE WORD IS A
1580 PRINT"■GAME WHERE YOU HAVE
1590 PRINT"■TO FIND A HIDDEN WORD
1600 PRINT"■IN A GRID OF LETTERS
1610 PRINT"■CLEAR ?
1620 GETA$:IFA$=""THEN1620
1630 RETURN
```

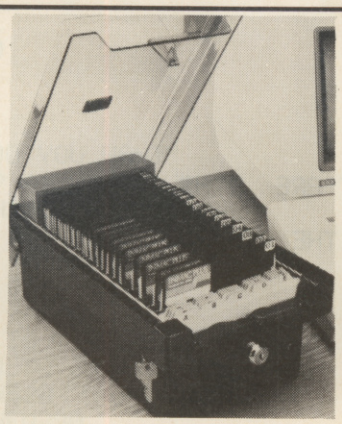
Keeping track of floppy disks

Inmac have launched Disk-Mate which helps you to keep track of all your floppy disks as well as what is actually on them.

This floppy filing system can hold up to 80 5¼ inch floppy disks in a system designed for instant, accurate location of disks and easy retrieval.

The DiskMate comes with 20 word-processing cards and 20 data-processing cards to record information.

Each disk is held in place by suspension clips which clip on to the disk envelope and under the file retaining bar on each side of the DiskMate. A control switch will flip open the retaining bar and thus allow you to insert new disks in a matter of moments.



The DiskMate floppy filing system from Inmac.

It is a dark brown moulded plastic box with a smoke grey hinged lid and a key. The cost is £37 although expansion packs with word-processing and data-processing cards and self adhesive labels cost £11. There is a full one year guarantee with a 30 day risk free trial period.

Inmac have also come up with a range of workstations which are supported by a welded steel frame and finished in oak or sapele laminate. There are three sizes available, 76cm deep and 110cm wide at £88, 76cm deep and 91cm wide at £79 and 61cm deep and 91cm wide at £76. There is also an optional shelf for £28 and, instead of the adjustable feet, a set of castors is available at £7.50. This is a self-assembly piece of furniture with tools supplied.

Contact: Inmac, Davy Road, Astmoor, Runcorn, Cheshire WA7 1PZ. Telephone: 09285 67551

Six-Four software range

There is a whole range of new products previously not available in this country which are being marketed by The Six-Four Supplies Company.

Totl Text is a word processor for the tape or disk systems which includes pagination, margin control, justification, centred titles and up to four heading lines on each page. There is also the expanded character set for the VIC printer. The user can print either from memory or from input device. The price of this is £31 for tape or £34 for the disk version. Each price includes VAT.

Totl Label is a datafile program whose files can be used in conjunction with Totl Text and other word-processors. Its main application is for mail labels but it can be used for any unheaded file system that contains data that must be sorted, accessed and printed. There are 255 characters per record. The cost of this is £16 and £19 for tape and disk respectively including VAT.

Totl Time Manager enters data about activities, project categories, personnel, actual or proposed dates and times for start and completion. The program prints bar charts in 54 optional formats. On tape or disk, the cost is £27 or £30 including VAT.

The Research Assistant lets the user enter and print out detailed source and reference information. The sort routine searches on the basis of up to 12 keywords from a sorted keyword cross reference list but you can only perform the edit operation on the disk version. The price is £27 and £30 for tape and disk respectively including VAT.

Music is one of the many great capabilities of the 64 and a new program called Note Pro II lets you control the pitch of each of the three voices using entries made on a treble clef screen display which allows you to input, examine and edit music on each screen.

The present facility in this program guides you through error-proof tone setting and a special machine language music play routine allows music speed potential of up to 450 notes per second. A four octave range is possible with variable tempo settings and a choice of legato or staccato for each note.

Note Pro Bridge is a machine language subroutine which may be copied freely and incorporated within any program. The retail prices for disk or tape are: Note Pro II £35, Note Pro Bridge £20 including VAT.

The PET Loader/Emulator is now available for the 64 and costs £15.50. This reconfigures the 64 memory regardless of any change to the ROM. Thus POKEs to the screen, to the program and other direct access operations work properly. This package will work with all PET software that does not use machine code.

The Recipe Box is for chefs as it is disk based database for the 64 costing £15. The menu program uses 17K of memory and sets up an ingredients file, recipe title/number file, ingredient numbers/quantities/units-of-measure file, recipe directions file and a category file. In normal use you have the options of adding to the ingredient file, printing that file out, entering recipes, ingredients, measures and directions etc.

Upgrading Basic V2 to Basic V4 is now possible through a cartridge port attachment called C64-Link, which permits you to use many of the existing Commodore printers and disk drives. The Basic V4 commands enable 64 users to run PET programs with much less modification than usual. C64-Link also provides a built-in monitor that is constantly available for relocating, adjusting or inspecting programmes in use. Built-in modem software allows the C64 to talk to other computers because any standard RS232 modem connected to the user port with the appropriate cable can be used.

Backup is a utility program for the 64 or the VIC. It allows the user to make back-up copies of cassette based programs in Basic and M/C. This works by by-passing the normal tape loading routines and a special program, File Clone, is used for duplicating sequential data files. Backup costs £15 including VAT and is sold subject to the condition that copies are made only for the purchaser's own use from the purchaser's own originals.

Contact: The Six-Four Supplies Company, PO Box 19, Whitstable, Kent CT5 1TJ.

IBM emulators

Apple Computer's announcement of an add-on unit which will enable the Apple 2 to run software written for the IBM Personal Computer is expected to have consequences far beyond Apple and IBM.

Experts see it as another important step forward in the rationalisation of the computer industry. For one thing it emphasises the pre-eminence of IBM in the industry and is an indication that IBM will become yet more dominant in the future.

Apple's plug-in card effectively enables the Apple 2 to emulate the IBM p.c. Commodore are expected to produce a similar add-on unit in the future.

The 64 was deliberately built with a large memory which gives it a great deal of flexibility. The Apple plug unit will cost $2,000 but experts reckon that a similar unit for the 64 could be sold for between $300 and $400.

The CBM-64 was actually built and marketed with the Apple machines in mind and the two are similar in many respects. It is reckoned to be relatively easy to produce a plug-in card for the 64.

Simple filing 64

'Simply File', previously available for the 40 and 80 column PET, is now available for the 64 and, according to the manufacturers, Simple Software Limited, it is even better.

'Simply File' is a disk based management system suitable for business and educational applications. It works with any single or dual Commodore disk drive. A single disk drive will hold upwards of 400 records depending on record size and programs used and a dual disk drive such as the 4040 allows about 550 full block records on a disk while the 8050 will hold about 1850 full block records with just the single disk working.

The maximum record size is 254 characters and this does not include field titles. Field size does not have to be specified. 'Simply File' is written in machine code and is more than friendly with the word-processor called 'Simply Write' which has also graduated from the 40 and 80 column PET to the 64.

'Simply File' on the 64 costs £60 whilst 'Simply Write' for the 64 costs £35 on tape and £40 on disk.

Contact: Simple Software Limited, 15 Havelock Road, Brighton, Sussex. Telephone: 0273 504879.

Soft spread

Supersoft have designed a new spreadsheet that follows in the footsteps of Busicalc. It is called Busicalc 2 and runs on the Commodore 64.

This new version of the original spreadsheet makes full use of the memory of the 64 and has 999 rows and 125 columns. Worksheets can have up to 2500 boxes of information and many of the functions are user-defined.

The program comes on either disk or tape costing £69 and £71 respectively and the formatted output can be provided by a Commodore printer. Software has been included that allows the 64 to drive an Epsom printer from the user port.

Contact: Supersoft, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ. Telephone: 01-861 1166.

Justification for a new word processor

A fully counting keyboard and a word processor all in one is exactly what is provided by a product called Typecraft.

It shows an author or typesetter exactly how text will look when it is typeset and the text displayed constantly shows all the typographical information required by the compositor to produce perfectly fitting copy every time. The system may also be used as a word processor and a small business computer.

Text is composed on the standard keyboard and is then transmitted to the typesetter by a modem where it interfaces with Compugraphic or Linotype typesetting systems.

Additions and deletions in text are immediately counted and justification is performed immediately. The status line at the bottom of the screen constantly displays the font name, measure, point size, width, horizontal and vertical counts, tab columns and typesetting commands.

The disk filing system allows for the creation of documents containing multiple chapters, each containing many pages. The terminal will hold a capacity of 15,000 characters per file and the number of lines displayed on the screen and characters per line is 18 and 117 respectively. Typecraft is based on Wordcraft and the results of this can be output on dot matrix and daisy wheel printers.

Contact: Typecraft (UK) Limited, Shirley Lodge, 470 London Road, Slough, Berkshire SL3 8QY. Telephone: 0753 49444.

Hofacker enter the UK

Hofacker are a new name to the British computer industry but they are ready to establish themselves here with two hardware products for the Commodore 64.

The first of these is called Bliztext, a word-processor with more than 70 commands, incorporating the INCLUDE command which allows the handling of large files on up to four diskettes. This is a fully screen-oriented product with scrolling up, down, left and right as one of its main features. It is fully compatible with Commodore peripherals and works with many other makes of printers.

It has built-in software for electronic mail, networking and there is also a telecommunications mode. The program is available on disk and cassette.

Their second product of interest to 64 users is Macrofire, an editor and assembler. There are three elements to this program: a fully screen-oriented editor with more than 70 commands; a very fast assembler with macro capability and, finally, a machine language monitor.

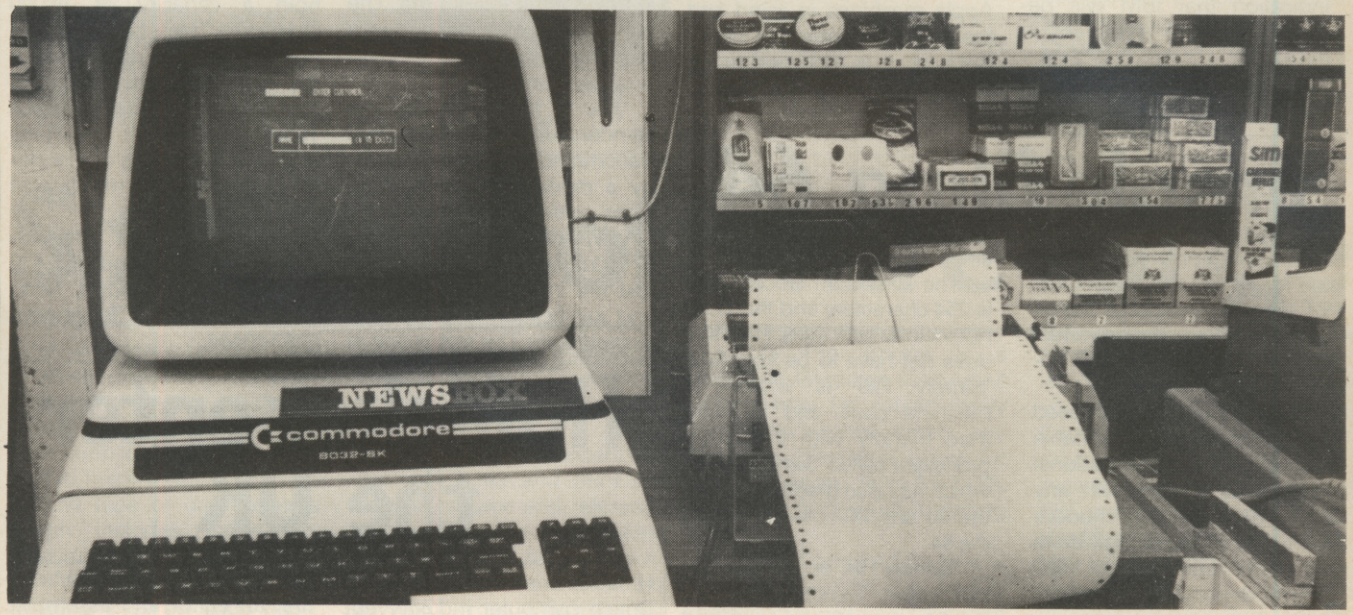
The assembly can be started from the editor and the manufacturers claim that the program has "practically everything the serious machine language programmer needs everyday."

Although they are established in Singapore, America and West Germany, Hofacker are still looking for distributors in the UK to penetrate the British market.

Contact: Hofacker, Elcomp Publishing Inc., 53 Redrock Lane, Pomona, California 91766, USA. Telephone: (USA) 714 623 8314.

Spreading the good news

After some initial resistance the retail trade has welcomed computerisation with open arms. Perhaps the most complex job for a computer in retailing is the organisation of a newsagent's delivery round. We went to Bath to talk to Robin Hyatt of Huggler Newsbox who have developed a complete system for newsagents for use on Commodore machines.



In September of 1982, Newsbox took a newsagent's package over from a company that had gone into liquidation. They improved the package and then several newsagents were approached in the hope that they would be the 'guinea pigs,' providing feed-back which would help further improvements to be made. In September of this year, Newsbox merged with Hugglers, a firm in Jersey. This was a fortuitous merger, because Hugglers are well known in the newsagency trade as they have been marketing a manual system for 30 years. Their experience of the newsagents business blended with Newsboxes knowledge of computers made an ideal combination. A sign of the current success of the Huggler Newsbox package is that people are now approaching them.

The system this package is replacing is a manual system and the Huggler book is the size of a couple of telephone directories. Isabel McGregor runs Bathwick Newsagents with her husband Bob. It is a typical newsagent tucked away in a little side street crammed with toys, toffees, tobacco, and piles of magazines and newspapers. The only difference was that behind the lemon bon-bons was a complete set of Commodore hardware – the VDU, the printer with a till roll and the disk drive.

This system had replaced 4 huge volumes which were needed to cover their 786 customers, quite a large number to deal with. The major complaint of the manual system is that it takes so much time to do anything. If the price of a publication goes up one pence, someone has to go right through the four volumes altering the price on each customer's account, with the Huggler Newsbox system a single alteration will change the price throughout the system.

Similarly for the accounts which must be the biggest headache for newsagents, instead of taking a week or more going through each customers account adding the totals up, writing bills out and addressing envelopes, this package can do it in 1¼ hours. The greatest advantage of this package is the time it saves, although any free time is spent doing something else, but at least the boring repetitive tasks are eliminated and so are errors, which often result from this type of work. The traditional pink slip system has also been eliminated and this has not been well received by a lot of the customers who regard these slips as vital in the ritual of paying the paper bill!

When Newsbox first started they looked for two or three newsagents who would be willing to try out the system. At that time only enthusiastic people would have been willing to take a chance on an unknown type of system, but there were a few anxious to take chances. The feed-back these individuals provided was invaluable for Newsbox and with the ideas for improvements and additional features the package was soon ready for the market.

Now 150 sites around the country are

using the package and they have been approached from people in the U.S.A. and from Australia. Robin Hyatt found very little resistance to the idea of using a computer in his customers who saw it simply as a Business Tool. When Newsbox launched their newsagent package there were only about three other similar packages on the market, but now this has increased to about 25 although only one other uses Commodore machines. Huggler Newsbox have managed to maintain a market lead so far and with the merger with Huggler their hold on the market is probably fairly safe for a while.

The package runs on the Commodore 8000 series and the company can sell the whole system to a customer at a basic price of £3,250 excluding VAT. On the 8050 disk drive the package can manage 2000 accounts, but on the newer version; the 8250 it can handle 3000. At present the largest capacity needed by a customer is 2000 and the smallest has about 200 accounts. It can list up to 1000 publications, can deal with 100 rounds and 20 orders per customer.

The company consists of a three man sales team who can move around and demonstrate the system to potential customers and a support software team who look after the existing users. When installing the system, a two day training course is given and this is broken up so that questions can be asked after the user has used the system for a while. In fact the system is very user-friendly and designed to be used by people who know nothing about computers. Every conceivable option that may be needed in the newsagent's package is included and notice of any improvements of presentation and facilities is sent to all the existing users.

The program itself uses a menu system and has a built-in calendar so that it can tell which day of the week it is – rather than just the date. Very important since Sunday, for instance, is a very different day of the week for newspapers. Right through the system there are checks to make sure everything is working correctly and as safety back-up copies only take a few minutes, there is little chance of anyone losing all their information. Perhaps the most difficult part of the system is at the beginning when all the existing records have to be put onto file. It took the McGregors four months to put all their customers on file. The package comes with 450 of the most popular publication titles already on it.

The layout on the VDU is clear and information is centred to make sure it is portrayed clearer. There are eight options to choose from covering Rounds,

ALL PUBLICATIONS RECEIVED AS AT WEDNESDAY 4 MAY 83

PUBN NO.	TYPE	NAME	RECEIVED
2	D	SUN	36
3	D	DAILY EXPRESS	60
5	D	DAILY MAIL	48
7	D	MIRROR	36
9	D	STAR	24
11	D	DAILY TELEGRAPH	60
15	D	FINANCIAL TIMES	48
21	D	GUARDIAN	36
44	D	SPORTING CHRONICLE	24
45	D	SPORTING LIFE	24
49	D	THE TIMES	12
52	D	LOCAL DAILY NEWS	24
60	E	LOCAL EVENING PRESS	78
62	S	SUNDAY EXPRESS	3
63	S	NEWS OF THE WORLD	1
64	S	SUNDAY MIRROR	3
66	S	SUNDAY PEOPLE	3
68	S	SUNDAY TIMES	5
69	S	MAIL ON SUNDAY	3
70	S	SUNDAY TELEGRAPH	2
72	S	THE OBSERVER	2
92	W	SUNDAY POST	1
93	W	U.K.PRESS GAZETTE	1
100	W	LOVING	5
101	W	WOMAN	25
102	W	WOMANS OWN	25
103	W	WEEKEND	0
105	W	R.& F'BALL OUTLOOK	15
110	W	ANGLING TIMES	6
111	W	AUTOCAR	2
112	X	RADIO TIMES	10
113	X	T.V.TIMES	8
120	W	BUDDY	2
121	W	COUNTRY LIFE	2
122	W	NEWSAGENT	4
123	W	DALTONS WEEKLY	8
130	W	THE CHURCH TIMES	1
131	W	BOXING NEWS	3
132	W	FARMERS WEEKLY	1
133	W	HORSE & HOUND	1
134	W	MY WEEKLY	1
140	W	BEEZER	0
141	W	BUNTY	1
142	W	GROCER	1
144	W	MY GUY	0
145	W	WORLDS FAIR	1
200	M	ANNABEL	3
210	M	BIKE	2
220	M	C.B.RADIO	2
230	M	CUSTOM CAR	3
240	M	COSMOPOLITAN	2
250	M	GOOD HOUSEKEEPING	1
260	M	HOME FREEZER DIGEST	2
270	M	MOTOR SPORT	2
300	M	WOMAN & HOME	5
310	M	WHICH COMPUTER	2

A record of the newspapers and magazines that the newsagent has received from his wholesale supplier is just as important as the record of what he's sent out. This printout shows the publications received in one day. Initials in the 'TYPE' column refer to frequency: D = daily, E = evening, S = Sunday, W = weekly, M = monthly and X refers to extras.

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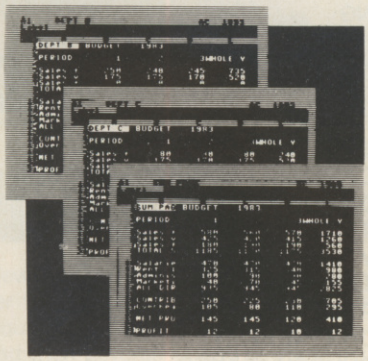

CalcResult's powerful three dimensional spread sheet format rapidly becomes an irreplaceable tool for those involved in figure manipulation and relationship. Budgets reports, statements, forecasts and planning are all areas in which a saving in time and resources are as important as the ability to handle all forms of calculations. The many features of CalcResult simplify the rapid production and calculation of all aspects of business forecasting and planning. Each model can have up to 32 pages of associated information with a consolidated report and every page has 63 × 254 data positions which can contain text, formulas or values. CalcResult's powerful editing functions mean rapid creation and amendment of models and, once created, split screens and multiple page viewing allow easy review of information.

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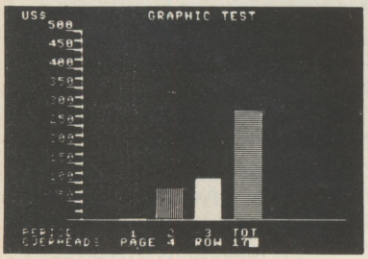

CalcResult can translate rows of columns of numbers into histograms on the screen or printed histograms can be used to enhance presentation of tabular information in reports. (With CalcResult 64 full colour options are available on the screen.)

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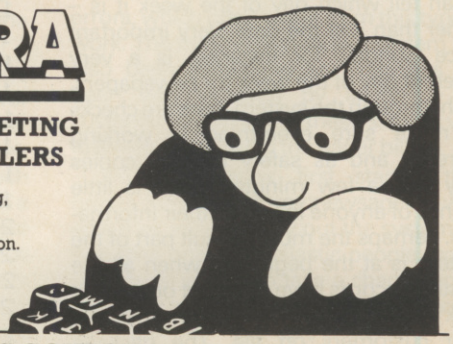
Telephone
(0491) 572512



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Name _____

Address _____

_____ Tel. No. _____

```
CUSTOMER DETAILS                CUSTOMER ORDER                  WEDNESDAY 4 MAY 83
                                PUBLICATION                     PRICE   QTY DELIVERY
-----------------------------------------------------------------------------------------
(22) ALLISON                          DELIVERY                   .15
THE ROBBINS                     (21)  GUARDIAN                  0.23   1    MON-SAT
            M    E    S          (60)  LOCAL EVENING PRESS       0.15   1    MON-SAT
ROUND NO. : 3    2    3          (62)  SUNDAY EXPRESS            0.28   1
                                (63)  NEWS OF THE WORLD         0.25   1
A/C PERIOD: SPECIAL             (100) LOVING                    0.25   1
                                (110) ANGLING TIMES             0.30   1
                                (101) WOMAN                     0.24   1
                                (102) WOMANS OWN                0.24   1
                                (200) ANNABEL                   0.40   1
                                (210) BIKE                      0.80   1
                                (300) WOMAN & HOME              0.55   1
                                (310) WHICH COMPUTER            1.00   1

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```
-------------DELIVERY REVENUE-------------
DELIVERY CHARGES  A,B,C,D ARE  10  15  20  0  PENCE ON WEDNESDAY 4 MAY 83
DELIVERY RATIO (M:E:S) =  1 : 1 : 1
ROUNDS CHARGED BUT NOT DELIVERED
MORNING
EVENING
SUNDAY
MORNING ROUND NO                DELIVERY REVENUE £
              1                       0.64
              2                       0.71
              3                       0.63
TOTAL FOR MORNING ROUNDS                  1.98
EVENING ROUND NO                DELIVERY REVENUE £
              1                       0.35
              2                       0.21
              3                       0.00
TOTAL FOR EVENING ROUNDS                  0.56
SUNDAY  ROUND NO                DELIVERY REVENUE £
              1                       0.34
              2                       0.16
              3                       0.41
TOTAL FOR SUNDAY  ROUNDS                  0.91
TOTAL FOR ALL ROUNDS                      3.45
```

Keeping a constant check on delivery revenues is another important function of the Newsbox system.

Accounts, Systems Reports and Shop Records.

All the options are to make things clearer and easier for the user and any information on customers, stocks, financial affairs and the rounds can be recalled very quickly. The Publications List can record up to 1000 titles and can list separately dailies, Sundays, weeklies and monthlies. Their current price and the standing order quantities are also listed. Print-outs can be obtained for each customer taking a publication and the details are listed in order showing what each customer has ordered and the total number that is required for delivery and shop saves.

The example of a customer's details is shown here and lists the standing order, the relevant round number, the delivery charge and the total weekly and monthly order values. A customer directory enables the user to access into the account of any of his customers very quickly.

With the manual system a customer going on holiday means time spent changing his account, the rounds etc, but with the list of holiday stops, the user can list them all and also record which publications need to be held for delivery on the customer's return. For publications such as *TV Times* which is needed a week in advance the publication is automatically stopped and restarted a week before. The standing order log lists all publica-

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The new Huggler Newsbox.
The system that takes the paperwork out of paper rounds.

So now you can get all the benefit of Huggler's understanding of your needs combined with the technological expertise of Computanews, working for you all round the clock.

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Name: _____
Address: _____
_____
Tel. No: _____

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tions relevant to the day of printing and enables the user to record the publications received and check them with the wholesaler's invoice. The changes in standing order deliveries on rounds can also be shown.

Another useful printout is a list of the publications that have been received each week and from this the newsagent has an idea of how many publications he must order for the next week. An example of a list of publications is shown here. If the price of a publication changes the previous two price changes are also kept on record enabling any customer queries on bills to be checked. Previous delivery dates are recorded so if a customer is worried that he hasn't received his publication it can be checked.

Delivery rounds must be one of the most important aspects of a newsagents business and this system has ironed out a lot of the associated problems. It provides a clear print-out for each round usually one in the morning and another in the evening. All irrelevant information is eliminated and holiday stops and the relevant publication holds are highlighted, as can be seen in the example of the rounds list. Publications for the round are listed to help the rounds person pack the correct number of each. The customer delivery sequences can be checked and a print-out produced for each individual round.

The delivery charges for each round are divided between the customers and then added onto the customers account. Revenue obtained from delivery can be checked at any time and comes in the same form as the example of a delivery revenue print-out.

Accounts present the main problem to the newsagent, but with this system everything is co-ordinated to make the accounting side much simpler and less time consuming. Customer receipts are printed weekly and any outstanding balances are shown. It is in the form of a ledger system for manual payments and there is a space for entry of "Paid up to" date as can be seen from the example of a customers receipt. There is also a point of sale option and individual payments are made easier. This function is the subject of much interest from customers of the Bathwick Newsagents. One 90 year old lady finds the whole concept absolutely wonderful and thoroughly enjoys seeing her name on the screen and receiving 'computerised' invoices.

However this view is not shared by every one. Isabel said that it was the younger and middle-aged customers that were suspicious of this new system rather than the older generation. When a customer comes in to pay, the VDU shows customer details, the amount paid and any balance outstanding. The receipt is produced on till-roll style stationery.

Customer invoices can be printed ir the morning round to facilitate easy delivery and on it four lines of sales message or selective reminders for debtors can be printed as in the example of a customer invoice. For the debtors, a breed common to all businesses, there is an option available for listing all customers and showing a breakdown of their debt.

Robin Hyatt listed what he thought were the main advantages of the system – it saves time, provides better cash flow information, less errors occur and so less complaints are received and there is more accuracy with the accounts and stocks. Generally an overall improved efficiency. Isabel McGregor backed this up saying that it had proved itself many times over. Her husband, Bob had been thinking about installing the system for a while and had finally taken the plunge, investing in the system in July of this year. She was obviously thrilled with it and apart from a few teething problems at the beginning they had had no problems at all, apart from the occasional distrustful customer!

Contact: Huggler Newsbox, 9 Walcot Street, Bath, Avon BA1 5BN. Tel: 0225 60541. Cost £3,520.

Below: *The system can also provide receipts for all the newsagent's customers.*

```
CUSTOMER RECEIPT/S AS AT WEDNESDAY 4 MAY 83
-------------------------------------------------------------------------------

(22) ALLISON                                AMOUNT PAID      ALLISON          *  22
THE ROBBINS                                **************   ****************************
        WEEKLY ORDER VALUE =      3.99     *            *   * PAID UP TO  *            *
        VALUE OF MONTHLIES =      2.75     *            *   *             *            *
   1   (S) O/S AT 4 /5 /83 =     14.52     **************   ****************************

(1) ATKINSON                                AMOUNT PAID      ATKINSON         *  1
1 PARK LANE                                **************   ****************************
        WEEKLY ORDER VALUE =      3.81     *            *   * PAID UP TO  *            *
        VALUE OF MONTHLIES =      0.00     *            *   *             *            *
   1   (S) O/S AT 4 /5 /83 =     12.47     **************   ****************************

(4) BLEASDALE                               AMOUNT PAID      BLEASDALE        *  4
4 PARK LANE                                **************   ****************************
        WEEKLY ORDER VALUE =      2.23     *            *   * PAID UP TO  *            *
        VALUE OF MONTHLIES =      0.65     *            *   *             *            *
   2   (M) O/S AT 4 /5 /83 =     10.81     **************   ****************************

(17) DANIELL                                AMOUNT PAID      DANIELL          *  17
3 FAIRWAY                                  **************   ****************************
        WEEKLY ORDER VALUE =      0.38     *            *   * PAID UP TO  *            *
        VALUE OF MONTHLIES =      0.00     *            *   *             *            *
   2   (M) O/S AT 4 /5 /83 =      1.58     **************   ****************************
```

Accounting for business

The software available for Commodore machines is proliferating so much that businessmen and women are faced with a bewildering choice. We take a look at one of the latest packages from Studio Software.

One of the major areas of concern to small businesses is computer control. Should they continue with the older manual system of business accountancy which is generally becoming outdated? Considering the relatively small amount of capital generated by the business, will the initial heavy financial outlay for hardware and software represent a considerable saving in time and money in the long run? Or will the investment actually turn out to be money down the drain?

These are all questions which the average businessman finds very perplexing and there are no hard and fast answers to any of them. However, part of the answer can be found merely by looking at products, just as a first time house buyer looks at a house with no intention of buying. There are many software companies who are producing business packages to order or packages that can simply be bought 'off the peg'. One such company is Studio Software with a suite of programs called BusCom.

These programs are all either tape or a disk and they can be used on the VIC or the 64 along with printer and cassette deck or disk drive. Like all other such software packages, the aim of the suite is to give the small business an accounting system that will produce clear and accurate records that can be sent to an accountant for the final accounts to be prepared. There are four different sets of accounts rather unimaginatively called BusCom 1, 2, 3 and 4 and these are currently all available on separate forms of media. Whilst the merits of this are clear to users who wish to buy one program separate from the other constituents of the suite, there is undoubtedly a strong case to put all the programs on to a single disk, thus producing a more compact appearance and saving the user reloading time every time they want to switch from stock accounts to retail accounts.

Rather a more serious criticism is that the system is not a little more user-friendly. An example of this can be seen on the first screen of BusCom 1 which deals with the monthly accounts. This screen comes up with the user prompt 'enter date' which works fine if the correct data is entered. However, if illegal data is entered, one normally expects a message to appear on screen telling you as much. Alas not so. In this case the program hangs up resulting in a very blank screen.

One redeeming fact is that Studio Software do provide demonstration programs. These will cost the poential user but they can be obtained on the understanding of a refund if the demonstration packs are returned or the cost can be taken off the purchase price of the program should the user decide to buy the system. Whether on disk or cassette, all the user has to do with the demonstration pack is LOAD, RUN, relax and watch.

As stated previously, BusCom 1 is all about monthly accounts and is intended largely for businesses paying by and being paid by cheques and is available in two versions, one of which includes VAT. This part of the system is divided into three main areas, each of which are menu-selectable. The sales account allows the user to enter cash or cheque receipts into one of three columns. These receipts may then be recorded against the name of the buyer and the total of the sale

	TAKINGS		ANALYSIS			BANKED	
	CASH	CHEQUES	GOODS A	GOODS B	GOODS C	CASH	CHEQUES
MONDAY	15.00	20.00	20.00	10.00	5.00	0.00	0.00
TUESDAY	30.00	40.00	40.00	20.00	10.00	25.00	45.00
W'SDAY	45.00	60.00	60.00	30.00	15.00	0.00	0.00
TH'SDAY	60.00	80.00	80.00	40.00	20.00	25.00	45.00
FRIDAY	75.00	100.00	100.00	50.00	25.00	0.00	0.00
SAT'DAY	90.00	120.00	120.00	60.00	30.00	25.00	45.00
TOTAL	315.00	420.00	420.00	210.00	105.00	75.00	135.00
LESS BAD DEBTS		5.00	5.00				
TOTAL	315.00	415.00	415.00	210.00	105.00	75.00	135.00

TOTAL SALES 730.00 NET SALES = 634.78 VAT AT 15% = 95.21
BALANCE AGREED

BANK ACCOUNT FOR WEEK ENDING

DETAILS	PAID OUT	RECEIVED	BALANCE
OPENING BALANCE			240.25
CASH PAID IN			
		25.00	
		25.00	
		25.00	
			315.25
CHEQUES PAID IN			
		45.00	
		45.00	
		45.00	
			450.25
BAD DEBTS	5.00		
			445.25
123	120.00		
124	100.00		
125	33.56		
126	22.00		
			169.69
	0.00		169.69

This sample of a bank account summary shows how Buscom presents information.

entered into another column. For those who like to keep a weekly record of their income up to five weekly sections can be totalled to arrive at the monthly sales figures. Purchases keep a record of all products and materials bought in by the business. These purchases can then be analysed and entered into 10 user definable columns and thus you can enter records of payments for all overheads like lighting, heating, rates, telephone and extras like costs of transport. Wages can also be included as an overhead, but these are fully dealt within the BusCom 2 system. Bank accounts are obviously important to any firm and details of amounts paid in and out are kept in a screen designed to look like a bank statement which is clear and easy to understand.

There are many different ways and means of operating a wages system and Studio Software have come up with two wages programs, one for a weekly payroll and the other for a monthly payroll. Each of these are flexible enough to accomodate differences in basic pay, tax, overtime and other wage requirements. For instance, R U Rich may be on the same basic wage as I M Poor but the latter has done more overtime, pays less tax and comes out with more money.

Two tax tables are built-in to the system making PAYE pretty easy to operate. The actual wages slip when it has been printed out will show masic pay, overtime and bonuses to total the gross pay. Also shown is the gross pay to date and all the deductions the employer has to make giving the net pay. Almost any number of copies can be printed out, so pay records can be kept for reference by the management as well as the employee. When the payroll has been completely entered, a printout can be obtained giving full details of pay and deductions for the period, informing the employer of the total amount due to the dreaded Inland Revenue for tax and insurance.

Since Statutory Sick Pay has become a legal necessity, there is also a routine on the wages programs that will cope with this. Changes in tax and insurance are becoming ever more frequent these days, and when these do occur it is necessary to send the programs back to Studio Software for updates for which the users will be charged.

The third package in the series is BusCom three, a meny-driven book-keeping system designed for use by ordinary business people. The options here are sales, purchases, bank account and cash account, although the first three are very similar in design and capability to the corresponding programs found in BusCom 1. However, there are some differences worth noting.

In sales, the gross and net sales as well as the VAT are all automatically calculated and displayed. There is a command in the purchases program which enables the user to produce totalled columns, VAT received and paid out and the difference due to the Customs and Excise. Operating the cash account is simplicity itself. Just enter in the opening balance and add or deduct as much as you need for payments. The program prints out the closing balance so that an accurate record is available at all times.

The final set of programs in this suite is provided via BusCom four, a stock check system. Using this program, up to 400 record cards may be kept at any one time in memory with more being stored on tape or disc. Each card is capable of accepting several entries relevant to the actual stock item. For instance there may be a description of the item, cost price, retail price, current level of stock to mention just a few. These stock records can be added to or deleted, listed and printed. Add to this the fact that these records may be sorted and found merely by specifying any one of the record entries and anyone can see that this program is very flexible. Of course, all the data can be stored on disc or cassette and programs can be amended to suit individual needs.

The cost of the software is £19.95 for the cassette versions and £21.95 for the disc versions. The address of Studio Software is Wootton Hall, Wootten Wawen, Warwickshire, telephone 05642 3467 or 0789 740588.

Loading any type of program into the micro from a cassette deck takes a notoriously long time, usually six or seven minutes. Quick Count have gone one step further than most other companies in this respect because their program, Book-keeping System for the Cash Trader, takes a total of 13 minutes to load. The program is also split into two sections, each section having to be loaded separately, the second section immediately after the first.

Despite these disadvantages, it is a very universal system (which it should be considering the cost – £89.75 including VAT!).

The whole system can be controlled by only a few keys: Return, up arrow, Y or N in replay to the prompts and C to continue. The up arrow serves a function similar to that of Return because it returns the user to the previous step. However, if it is used at the beginning of a procedure it means terminate. There are dangers when using this key in its former context, because you can step back too far and find yourself having to reload the whole program again, thus wasting another 13 minutes.

On loading the program, the initialising routine acts as a security device and also

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- Number of records limited **only by your equipment**. can be thousands
- As many databases as you want – each with up to 15 files
- Learn fast through built-in HELP screens – then add your own notes

FAST ACCESS
- Keyed records for high speed retrieval – 3 secs for any file size
- Select and search for any name, description, number, date, etc. in multiple combinations
- Sort records into any order
- Display selections or generate printed reports
- Browse through records matching on any criteria

TOTAL CONTROL
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- Effective management of invoices, addresses, stock, membership, appointments – any and every kind of record
- English like commands for easy conversational programming, plus built-in BASIC

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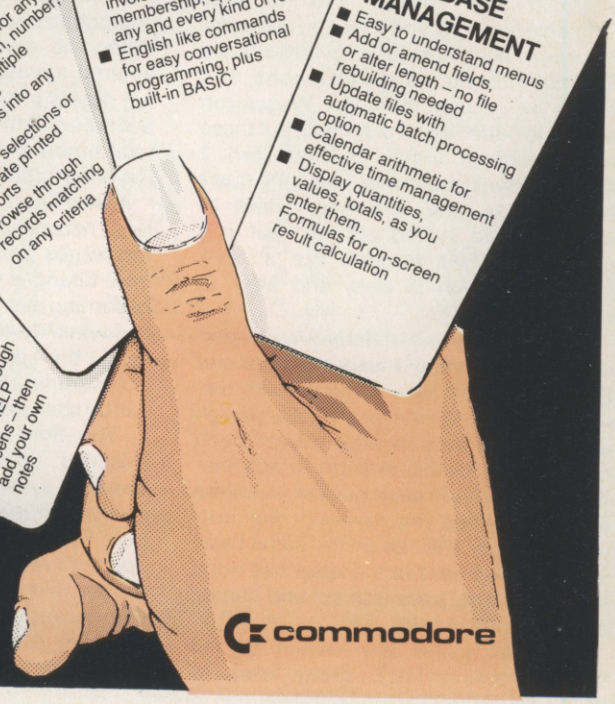
- Easy to understand menus
- Add or amend fields, or alter length – no file rebuilding needed
- Update files with automatic batch processing option
- Calendar arithmetic for effective time management
- Display quantities, values, totals, as you enter them. Formulas for on-screen result calculation



Precision Software

Superbase 64

Precision Software Limited,
Park House, 4 Park Terrace,
Worcester Park,
SURREY KT4 7JZ ENGLAND.
Telephone: 01-330 7166
Telex: 8955021 PRECIS G

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*****************************************************************************
PURCHASES & ANALYSIS FOR MAY 12TH 1983

                                          TRADE
 NAME          CHQ     AMOUNT             GOODS   RENTS   PHONE   MOTOR    LABOR
T.JONES        123      12.50             12.50
R.SMITH        124     120.00                     120.00
W.BROWN&CO     125     100.00                             100.00
S.GREEN        126      33.56                                     33.56
WHITE BROS     127      22.00                                                22.00
G.ASPREY       128      50.00  K

TOTALS =               338.06             12.50  120.00  100.00   33.56    22.00
=============================================================================

   STNRY    REPRS    FXTRS    SNDRY     CAPTL      PRSNL
    0.00     0.00     0.00     0.00      0.00      50.00
-----------------------------------------------------------
    0.00     0.00     0.00     0.00      0.00      50.00
=============================================================
```

Monthly summaries of financial information are essential to ensure good cash flow.

sets the micro to produce output via a standard CBM printer. This can easily be reset to ASCII printers or a no printer option. It is rather difficult to see why this latter option has been included because most businessmen would prefer to present a print out to the Inland Revenue rather than a set of handwritten reports.

Setting up the system is actually done by selecting the utilities option on the initial menu. This only needs to be performed once and the first prompt 'enter date' proves that no illegal data can be entered – 39/07/83 will be met with the appropriate error message.

Many competitive systems that are disk based (and others that come on cassette) have the capacity to hold a vast range of accounts although you can of course store an almost unlimited amount of information on tape. There is a total of 79 nominal accounts, which allow the user to enter a description and change it almost at will. These accounts are split between accounts which relate to trading, profit and loss and the final balance sheet.

The actual name of the account is limited to 16 characters. The cancellation of any description is performed by hitting the 'n' key and at the bottom of the screen this very user-friendly system comes up with a message printed in red which will only stay on the screen for a few seconds before the user is returned to the original nominal account screen.

Changing periods is one area of this system which is probably just that little bit below standard when compared with the high level standards set by the rest of the package. No less than three separate screens are needed to alter the week, quarter and year and in each case all the user needs to do is simply alter one date. It would be far easier and less time and space consuming if one screen catered for the complete range of period changes, even though a change in quarter and year does indicate a new week and that new year implies a new quarter.

In this system, all information is stored on cassette and, on dumping data files, there is a continual flashing of the screen giving a progress report on what information has actually been stored. However it is worth pointing out that here something is obviously missing from the programming, because the user can apparently 'dump' files even when the cassette deck is not connected to the 64! There are no prizes for guessing what is missing. Neither is there any form of warning when you wish to recall stored data and the necessary connections have not been made. However, all connections being present and correct, the user should find no trouble in dumping and recalling files.

Having performed the set up correctly, going back to the very first menu displays two more options post and display. In each case it is essential that a printer is connected. If the printer is not ready, the user will be unable to proceed any further because he will be transported back to the menu. Post is made up of four separate headings, these being daily takings, payments in cash, payments from the bank and journals. One of the functions of the latter option is to record the closing balance of the last financial year.

These balances are made up of the date, the number of the transaction and the account number that is to be debited and credited and a description of the account. Following on from this, the cost of the transaction needs to be entered before the screen output to the printer can commence.

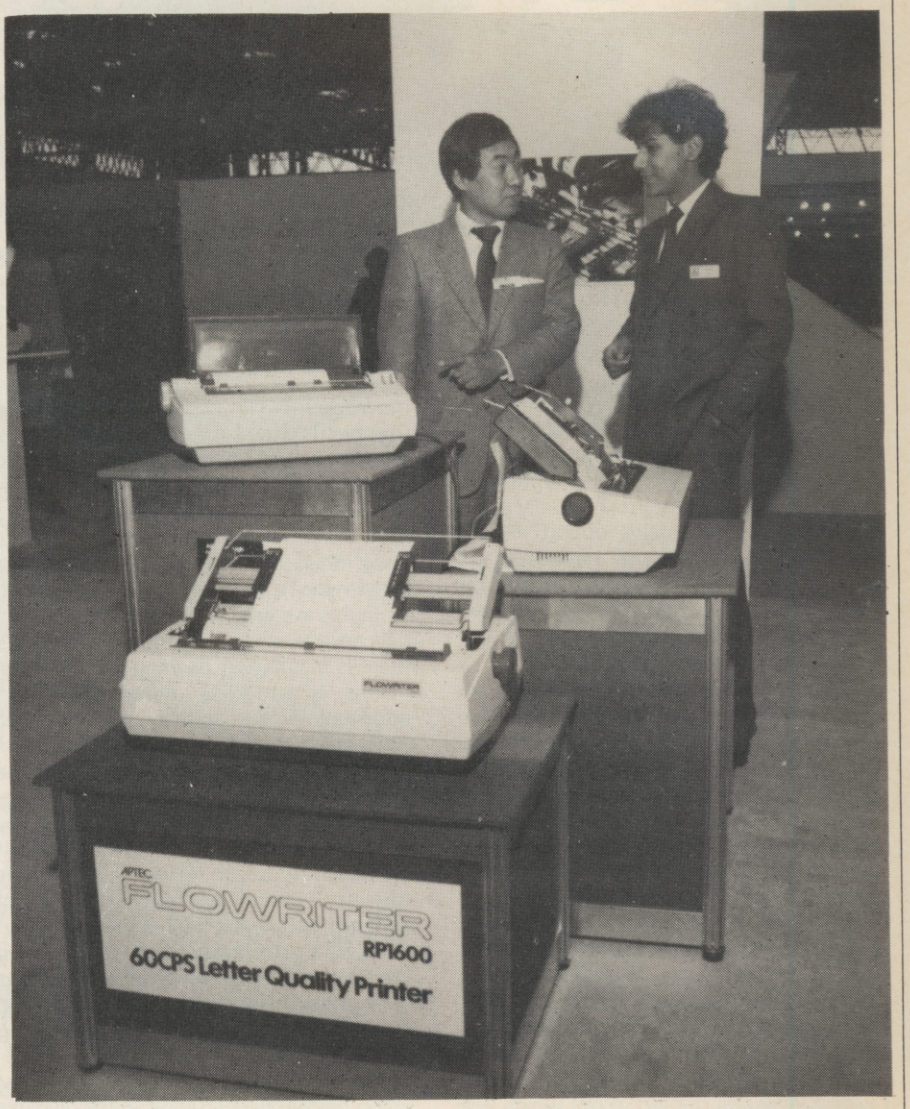
Payments, whether in cash or from the bank account, are recorded in a similar fashion, the only difference being the different address for the two accounts. In either case, the information that needs to be entered is date, transaction number and a description of the transaction. Payment should also be entered along with the VAT content and the net invoice can now be allocated against the nominal account.

Takings can be catered for in several different forms whether it is by credit card, cheque or cash. These takings can be posted to whatever account necessary.

In conclusion, this is a very comprehensive package for the small business. The operations are generally performed very quickly and efficiently. The major disadvantage that will hold this product back is the price because there are systems around that will do as much as this one for less.

Appropriate printers

The printers produced by Appropriate Technology have been increasing in popularity and the last few months have seen their reputation spread. We decided to take a look at APTEC's printers to find out the reasons for their success.



Appropriate Technology Limited have only been in business for a couple of years. Respect within the computer industry has increased so much so that at the recent Compex Show APTEC shared a stand with the Japanese company Ricoh. Despite their often quoted 'superiority' in technology over the West, the Japanese were amazed at the superior quality of the Flowriter range of printers produced by APTEC as were the many visitors to the stand.

The success of APTEC has been founded mainly on the success of the 1600 printer and the continuity of the Flowriter theme. There are currently three printers that make up this range, the heavy duty one being the 1600 which the manufacturers claim is the marathon-quality print-wheel machine designed to meet the rigorous standards set by offices where the printer is seldom idle.

This model has a solid MTBF of 4,500 hours and a test-bed print rate of 60 characters per second. One of the reasons that this is the heavy duty model is the fact that the 1600 weighs 22 kilogrammes. The claim is further justified by the printing features that are standard to the 1600 and non-standard with other makes.

Like all the other printers in the Flowriter range, the 1600 has been tested at APTEC's premises on the 4000 and 2000 series of PET's. The actual printing is controlled by the motherboard which is situated towards the back of the printer. The daisy wheel printer is made of plastic and has a dual set of characters which consists of the full 96 ASCII character set plus 28 additional special characters. The number of characters that can be printed per inch is variable and can be set at 10, 12 and 15 characters per inch, all of which can be printed bi-directionally by the movement of the optimised print head. No matter whether the paper is fed in manually or by tractor feed, the printer has the capability of printing up to seven copies at a time.

Information can be provided by several different sources because there is a range of interface connections that are available because the printers are not just compatible with the Commodore range of micro's. There is a choice of Serial, Centronics

Parallel and IEEE 488 Standard interfaces. Transmission format is asynchronous seven bit ASCII plus parity bit which is selectable as odd, even or none.

Data is transmitted at the standard baud rates of 300, 1200 and 9600. The protocol required to accept the information is, of course, entirely dependent on that being used by the micro that the printer is working in conjunction with.

As with many other computer controlled printers, there is a memory buffer. The size of this is 8Kbyte, although a 2Kbyte size is available. Printing format is controlled by external commands. Horizontal spacing is determined at either 136 characters per line or 163 characters per line. Under program control, the spacing varies from 1/120 of an inch to 127/120 of an inch.

Vertically, spacing is set at eight lines per inch although this can be commanded to any value between 1/48 and 127/48 of an inch.

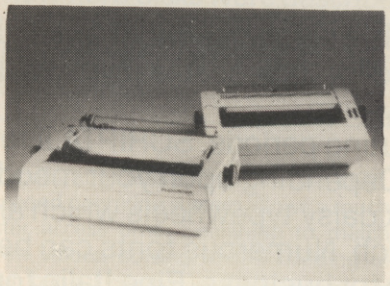
Printing can be done in red or black and the user can have advanced print enhancements like boldface, underlining and italics. Switching from normal print mode to the graphics capability is quite simple and means that the print head can be regulated down to 1/120th of an inch to produce charts, graphs, diagrams and picture drawing – all of these are standard features on the Flowriter range.

Compatible

Perhaps the most astonishing feature about this range of printers is the flexibility of the range. The range is compatible with an amazing 28 different micro's that go right through from the Commodore sector of the market straight through to the out and out business computers such as the IBM, Wang and NEC. It follows on from this, that for the Flowriter to be completely successful as a printer for these different micro's, the Flowriter range must be compatible with more than one or two pieces of software.

In fact there is compatibility with 15 applications packages and operating systems including CP/M, Silicon Office, Superfile, SuperCalc, TABS and VisiCalc. It is also a fact that there is compatibility with 15 word processors including EasyWriter, Spellbinder, Wangwriter and WordStar.

Compatibility does not end with packages and operating systems. As well as being fully compatible with Qume, Diablo and Spinwriter as a matter of course, the range is also Ricoh and Radio Shack compatible so extra wheels and ribbons are easy to get all over the world, and companies other than Commodore have written wordprocessors not only with Flowriter in mind but also around the Flowriter specifications which makes a change from the printer being designed



around the specifications of a package or machine. So far, this article has mentioned only one of the Flowriter printers. There are two more, these being the 1300 and the 1200. The 1300 is very similar to the 1600 apart from two criteria. Whereas the 1600 costs £1635, the 1300 is priced at £1245 (all prices excluding VAT) and the latter printer has a slower speed of 37 characters per second. Like the 1600, there is the same choice of interfaces, advanced print enhancements, buffer and space-skipping logic which is a built-in feature helping the print-head take the sensible route across the page. The Z80 microprocessor looks ahead at the data stream and makes sure that no time is wasted pausing to 'print' tabs, blank lines and spaces.

It is the 1200 that is very much the baby of the family in more ways than one. Lighter than the other two printers and therefore probably the better 'pick-up, plug-in and go' printer, it is this model that is the most recent (it was previewed at the recent IBS show and is to be launched officially in January at the Compec show). This model has been designed to be used by the small business and the very keen home user and has to be priced accordingly, probably for £500 or under which makes it sound very attractive.

However, this comparative low price does mean that certain aspects of the printer's predecessors are not avilable with this machine. The printing speed is much lower at 20 characters per second, the memory buffer can hold only 2K of data and the interface options are limited to the RS232C and the Centronics. Apart from the price, there is one feature that is on this printer which is not apparent elsewhere in the range. Neither the 1600 or 1300 has a touch sensitive front panel. The 1200 does and very smart it looks too. From the front panel the user can control the pitch, linefeed, power as well as there being an error indicator. Previous models have an audible error alarm which is activated.

Some small printers often restrict the user to a narrow 80 column paper size and that could lead to problems when it comes to using standard accounting software packages. This is not the case with the 1200 which gives the user a maximum of 165 columns which is probably more than enough to produce good quality tables and financial reports.

There are several accessories for the Flowriter range being offered by APTEC. There is a choice of black, blue or brown multistrike ribbons, each ribbon having a lifespan of 300,000 characters. The ribbon cassettes themselves are easy to install, the holding mechanism being a simple but secure clip. Fabric ribbons are installed by a similar process, but these ribbons (which can be black or black/red) have a greater lifespan of approximately 1,600,000 characters.

Lasers

There is a print shield to protect the paper whilst printing. The printer hammer flies through a small window in the print shield preventing the ribbon from causing any undue smudging on the paper or platen.

Paper can be fed in using the tractor feed (which can be BDT, Ricoh or Rutishauser) or via sheet feeds. To lessen the noise of any printer, there is also the acoustic hood which comes complete with the options of stand and paper basket. The 333 model encloses the Flowriter with the tractor feed attached whilst the 338H encloses the Flowriter with either tractor feed or sheet feed attached.

Despite the unparalled success of the Flowriter range, APTEC are not resting on their laurels. As far as APTEC are concerned, the name of the game is improve, adapt and invent. It is this policy which is pushing them far ahead of their rivals. One of the projects the 'backroom boys' are currently evaluating is the use of lasers in the printer. Naturally they were a little reluctant to give away their secrets, but if they do actually come out with a laser printer anywhere near the quality of the Flowriter range, it is bound to revolutionise the computer printing industry and is definitely something to look forward to.

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Hard disks – soft options?

A fully laden Boeing 747 flying at high speed just three feet above a concrete surface. Until recent technological innovations that was how hard disks were described. Now their unsurpassed capacity for storing information while at the same time keeping it easily accessible have made hard disks increasingly popular for businesses. Here we take a look at those companies who produce hard disks for Commodore machines.

I.M.I.

IMI computing have launched a massive campaign in Britain to market the new AP18 multi-user hard disk. Relatively new here, the AP18 has been used successfully in West Germany for the last 12 months and IMI have managed to sell 220 units to businesses plus 13 units on the stands at the huge Frankfurt Computer Show. Despite a formidably busy scheduling visiting and demonstrating the hard disk to various companies, Richard Burroughs brought the disk up to our office for a private demonstration of its abilities; mean feat as the disk is huge! The AP works on the Commodore 8000, 4000 and 700 series.

The AP18 has a Winchester memory giving the Commodore Machines a multi-user status, making it ideally suitable as the central mass memory. Up to 12 machines can be connected to the hard disk by means of long cables. The length of these can be increased from 20m to 1000m with a long distance module in the AP18 and the LD 488 unit in the micro. All the connected computers can access the memory simultaneously and can carry out the same or completely different tasks. The 5¼ inch disk has either a 18 or 36 Mbyte memory capacity and there are very few companies that would need more than this. An 18 Mbyte memory is equal to about 18 floppy disks and the average sale consisted of the 18 Mbyte and Data Streamer Cartridge. Due to the modern modular structure, the AP18 can be expanded after the first installation and so each system sold can be tailored to suit the customer individual needs.

An advantage of hard disks over the floppy disk drive is that is has a very large capacity memory (doubled with the addition of the 18 Mbytes) and so although the hard disk can be used for the single user it is not usual. Another difference between the two is the incredible speed that information comes up on the screen. Once called up, any file within any of the disk drives can come up on the screen within seconds. Unlike the multiplexer system, the operating system in this hard disk independently manages and communicates with each other. DOS, a second operating system allows a much faster access time. Searching to match given values, sorting or the building of data bank systems is made easier by Adcomp-DOS, a linear combination offering instructions such as Allocate, Search and also fast copying abilities. The AP18's compatibility with the Commodore Basic 4, the DOS 2.5 and the IEEE488 means that programs written for the CBM 8000 series can be used virtually without modification. In addition 40 relative files can be opened at the same time and each of these is about 4 bytes long. Any data which is put onto these files is sorted and duplicated every 30 seconds and there are two methods of doing this; either at or after the original delivery. If there is a second disk, the information on one drive can be passed onto the second and duplicated. The Data Streamer, the other data protector can copy the 18 Mbyte in 30 minutes onto the DC 300 XL magnetic tape cassette. This is probably the best method for data protection as the security cassette can be kept in a different location.

The AP18 Multi-user hard disk from IMI Computing: a central mass memory.

Richard Burroughs set the system up in our office and demonstrated some of its capabilities. The first thing the hard disk does when switched on is to automatically self test and when this is completed, a red light flashes on the control panel. It is easy to operate, once people have got over any initial nervousness or suspicion of the system. For some reason, people used to the floppy disk drive are averse to using the hard disk. There is a 64 K memory built into random access to speed up the access and any information can be sent backwards or forwards. Behind the hard disk, there are 12 ports and each one has a triple handshake controller which enables the disk to handle each attached computer separately. One of the disadvantages of the hard disk is that the IEEE is not full and so is not compatible with any of the computers unless the time out is altered although poking the time out takes mere seconds to complete. There are 4 drives on the 18 Mbyte and the layout and format on the VDU screen is exactly like that of the floppy disks which eases any transition from the floppy disk drives to the hard disk. With the 36 Mbyte capacity the number of logical drives increases o 8. Partitioning amongst the disks enables t wo micros to look at different parts of the disk and it is possible for one computer to talk to drive 1 and think that it is drive 0. Operates can find what computer they are talking to by asking the disk drive the port number and equally can be informed by the computer that it is no longer talking to them.

File and record locking is an important feature of a multi-user system and the use of good software must be stressed. On opening a file that has already been opened the disk informs the user that it is open. If however a program has been locked the user is informed that the file is not available – so any private or confidential programs can be kept safe. Record Locking must be a necessary consideration when planning new programs. An example of where the locking system is useful is in a situation where the stock room and order processing are connected. Two people – A and B, may be both taking orders and both using stock room information. If a customer orders all the available stock of product C, A will register this order on the product C file. If

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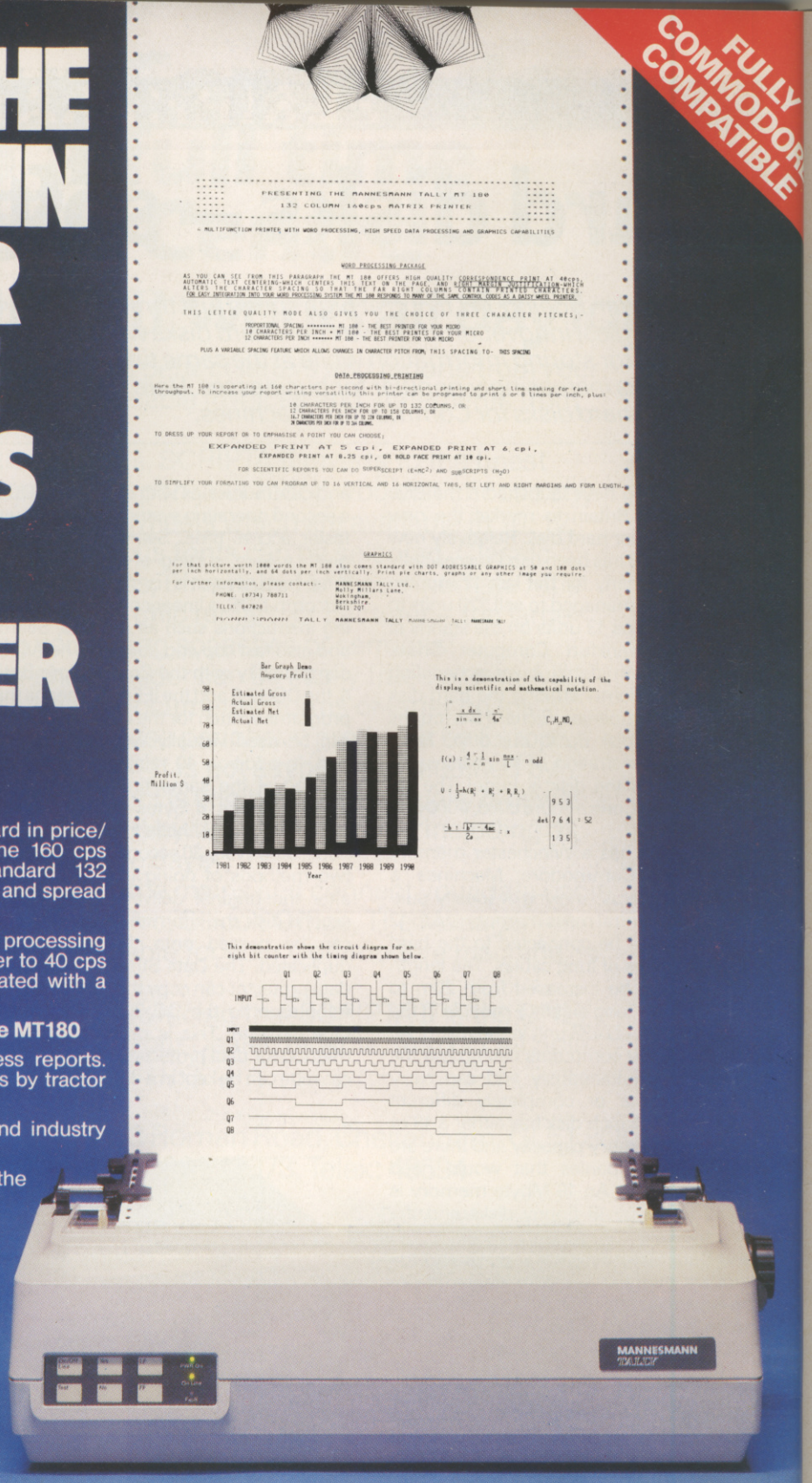

THE MT180 FROM MANNESMANN TALLY

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Note to microcomputer dealers — if you would like to handle these products then ring Geoff Thomas or Terry Bell on the M-T Direct lines — Wokingham (0734) 791619 and 791533.

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another customer then orders product C, B will not be able to access onto the file until A has finished with it. This of course stops B selling the customer something that has sold out.

The AP18 could form the basis of a powerful data processing and information system for distribution, manufacturing and research centres. There are numerous applications with which it could be used, for instance a secretarial pool where they can all use the Wordcraft word processing disk. Or perhaps within a big organisation where there are several different departments – accounting, word processing, stock control, order processing, sales which could be connected to a central common information bank. This would be extremely advantageous as effective communication within a large organisation is often difficult and the hard disk would eradicate any communication problems. The printer options are quite flexible. A central printer can be connected to an IEEE 488 output for use by all the micros, which would reduce printer costs. However it is possible with a few alterations to attach floppy disk drives and printers to each individual computer.

These disks are not yet on the dealers shelves and at present, IMI are really assessing the potential market possibilities here. IMI are going round to everyone that might be interested and are also relying on the dealers to give potential buyers advice. They have had a good response from some of the Businesses approached; Machsize have purchased one for the interfacing used at the Rolls Royce process Control and Sony UK have a floppy version for their data transfer. Richard Burroughs stressed the importance of good software and at present IMI are visiting various software houses to try and procure quality software. Wordcraft who are at present developing an improved Word Processing disk will be supporting and commending this hard disk to their customers and Bristol Software will also be developing suitable software for the AP18. In West Germany they have been using multi-user software for the last few months – an integrated Information Business System (IIBS) written by SM software.

There are not many hard disks being made in Britain at the moment which are suitable for Commodore. Commodore themselves are having a lot of problems with their hard disks – the 9090 and 9060 and the production of these has come to a temporary halt. In America, the larger companies recognised the gap for multi-user software and so developed the hard disk. Commodore could not offer any competition and in fact have endorsed the AP18, circulating its details to all their dealers and recommending it. The AP18 can be used with their relatively inexpensive computer systems and opens new doors for Commodore dealers. The most advanced technology has been used in making this machine and as a result of the care and expertise, the AP18 is extremely reliable and efficient. It is unfortunate for Britain that about the only British component of the hard disk Richard Burroughs brought in was Richard Burroughs!

The inner mechanism of most hard disks is extremely fragile and the head which reads and writes on the disk is never very far from crashing and causing a lot of damage. With the AP18 the disk heads are crash proof the disk surface is covered in a tough metal alloy which has a special place for the head to crash on if necessary. In fact an AP18 has never been known to crash and Richard Burroughs has put his model through some tough tests including dropping it onto the floor!

At present the AP18 is only compatible with the Commodore, but IMI are hoping to develop it for other models especially the IBM PC in West Germany. The AP18 needs very little service, but an advantage for British buyers is that all maintenance and servicing is carried out in the UK.

Compared to other disk drives, the main advantages of the AP18 are its high quality, reliability and the speed at which data can be accessed. Richard Burroughs thought that the main disadvantages were that the time out bug had to be poked and while calculating free blocks the disk did not like being disturbed and stopped if information was put in. It is expensive, but as Richard Burroughs put it – if you want quality you have to pay for it. A committed 8000 series user would pay that money and in fact it would probably work out less, as it saves providing a disk drive and printer for each computer. IMI have a six month warranty period.

Multi-user: 18 Mbyte Hard disk: £5299 + VAT. Additional 18 Mbyte: £1920 + VAT. Tape streamer for AP18: £2291 + VAT. Single User: 18 Mbyte Hard disk: £3660 + VAT, with tape streamer: £5586 + VAT. Company: IMI Computing Ltd., Address: PO Box 216, Witton, Birmingham B6 7BA. Tel: 021-356 4848.

Mator Systems

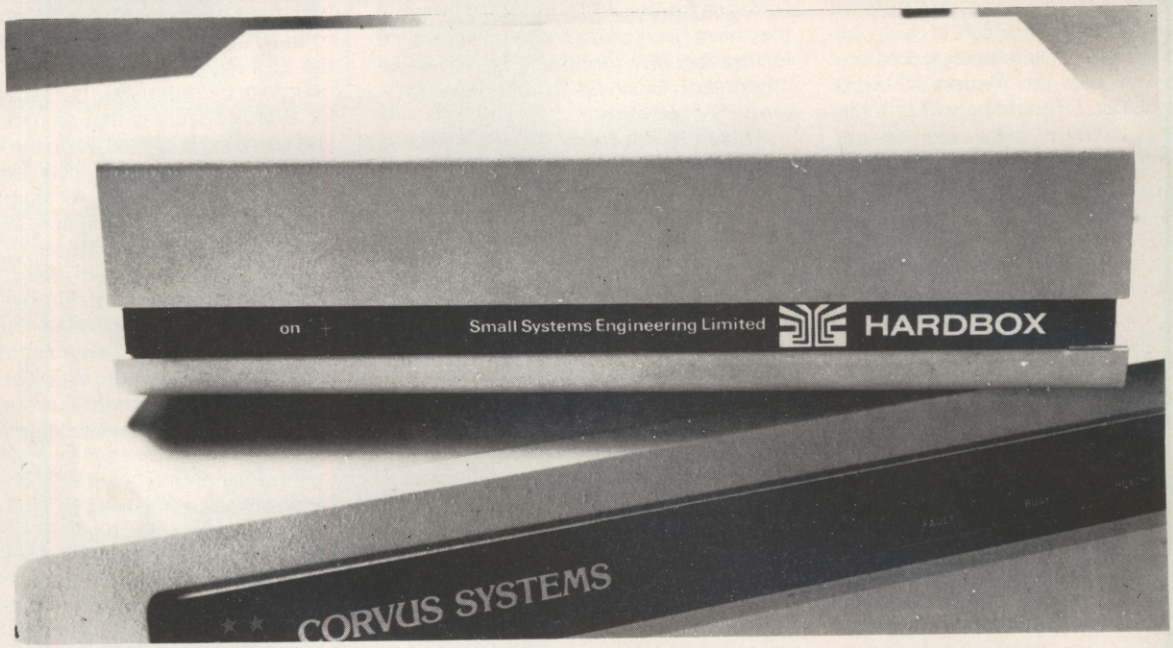
Mator systems have specialised in the design and development of microprocessor products since 1976. They design products which are used to connect computers, terminals and disks which would otherwise be incompatible. Recently they have produced a hard disk system for the Commodore Pet – the Shark and the Sharkive which is the fast tape back up system, so called because it is the archive for the Shark.

The 5¼ inch Shark is an intelligent Winchester disk unit consisting of a hard disk drive with Winchester memory, a power supply and an intelligent INTEL 8085A-based controlled contained in the metal cabinet, typical of hard disks. Also inside is a cooling fan, looms and a IEEE-488 socket. The Data storage capacity can be increased from 10 to 15 Mbytes and this Shark model forms a complement to other Shark units which extend up to 120 Mbytes in capacity.

The Mator Shark appears identical to the CBM 8050 floppy disk drive to the Commodore Pet because of the way it handles its IEEE-488 interface and in the command set it supports. Since its IEEE device is switch selectable it can be used in any Pet configuration. It is also possible to connect more than one Mator Shark in one configuration. It does differ in one major respect – it provides the Pet with two logical drives each with a full 10.5 or 14.5 Mbyte capacity. With this new capacity, entirely new application areas for the Pet are opened up and it can handle vast amounts of data storage; Stock Control, Mailing lists, Personnel Records for example. The performance of the Pet is increased substantially and it can even be as much as 5 times more effective. Other interfaces compatible are the Intel Multibus and the RS232C. The Sharkive is a streaming tape system which uses the standard 300XL quarter inch removable magnetic tape system. Each cartridge has a formatted capacity of around 11 Mbytes of data and the system can hold the entire contents of a 22 Mbyte Mator Shark on two cartridges. To achieve the necessary high transfer of data between units the

The 5¼ inch Shark from Mator.

HARDBOX—Hard Disks for Commodore Micro-Computers



HARD DISK INTERFACE
HARDBOX is the intelligent controller that lets you add a Corvus hard disk drive to your Commodore computer. In fact, you can chain up to 4 hard disk drives of 6, 11 or 20 Megabyte capacities.

Compatible with CBM DOS versions 1 and 2, the HARDBOX operates with existing Commodore programs and appears to the Commodore as a high speed, high capacity floppy drive.

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Create a multi-user network by adding the Corvus Constellation multiplexer to your hard disk system. With a HARDBOX at each work station, up to 64 users can simultaneously access the same drive.

As a multi-user system, the HARDBOX provides:
- Separate user areas on each hard disk.
- Multi-user work areas for shared programs.
- File and record locking for shared databases.
- Password protection of user areas.
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Video Cassette Backup
The HARDBOX supports the Corvus *Mirror Option*. This provides a high-speed, low cost means of backup, using a commercial video cassette recorder. Backup speeds of 7½ kilobytes per second let you save contents of a 10 MByte drive in less than 20 minutes. Video cassette capacity is approximately 100 Megabytes.

Hardware Requirements
- Commodore 3000, 4000, or 8000 series computer with BASIC 2 or 4.
- One HARDBOX and PET-IEEE cable per work station.
- Corvus bare drive and ribbon cable.
- Access to a floppy disk or cassette.

Price.....£495.00

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Sharkive has to be attached directly to the Shark. Each Shark has provision for this connection and can be linked via an extension to the Shark DOS. Transfer of data is accomplished by Direct Memory Access providing a transfer rate of 0.8 Mbytes per second. There is a self test mechanism which enables the user to check if there are any faults developing.

There is a range of integral disk operating systems the Mator DOS, the Commodore Pet DOS 2.5 emulation and track or sector addressing suitable for interfacing to CP/M etc. The Shark's internal Disk operating system (DOS) includes some of the following facilities; sequential file manipulation, program save and load, direct and memory access facilities, a disk capacity, housekeeping facilities and an automatic Directory search. The speed with which data is transferred from disk to controller to tape and vice versa is fast and the Sharkive is an efficient means of backing up and restoring the data on disk. The combined effect of the Shark and Sharkive is to provide the Pet with a high-speed, high-capacity storage system. It can be used in the same way as the 8050 disk drive and can take full advantage of the software available for use on the Pet. A full parts and labour warranty is provided with all Mator products and both Shark and the Sharkive are approved by Commodore.

Cost: 22 Mbyte Shark £3695 + VAT, 39 Mbyte Shark £4095 + VAT. Sharkive £1895 + VAT. Company: Mator Systems Ltd., Address: 134-140 Church Road, Hove, Sussex BN3 2DL. Tel: 0273 726464.

Small Systems Engineering

The most recent hard disk from Small Systems is the MW1000 and it is compatible with the Commodore 2000, 3000, 4000, and 8000 series. The initials stand for Mini Winchester and refer to the small size of the drive which weighs 4 kg and is 100mm in height. It also has a relatively small Mbyte capacity compared to some of the other hard disks compatible with Commodore and the three different models available are the 5, 10 and 15 Mbyte systems. The hard disk can run under the CP/M version 2.2 operating system which runs on the X80A processor, and is also compatible with the CBM DOS versions 1 and 2, with the exception of the commands: MEMORY-READ-WRITE-AND-EXECUTE.

For each system there are different configurations available, so that a potential user may purchase only the exact parts of the system that he will need. This could save money as buying the whole system would be an unnecessary expense if some of the functions were not needed. For instance with the 15 Mbyte system there are three choices of configuration; Choice A has the PET-DOS version 1 and the 15 Mbyte PET-DOS drive, Choice B has either version 1 and the 7.5 Mbyte PET-DOS drive or version 2 and the 3.75 Mbyte CP/M drive and Choice C has version 2 and the 7.5 Mbyte CP/M drive.

On the PET-DOS system there is a 15 Mbyte file capacity and each 15 Mbyte drive can store 4500 files. Each record has a memory of 256 Bytes and each drive can hold as many as 65535 records. At any time 13 files can be kept open and the drive access time is about 40 milliseconds. With the other operating system, the CP/M, the memory of each file is 7.5 Mbytes in each logical drive and 256 files can be kept in any drive. The access time is the same at 40 milliseconds. Among the functions of the CP/M is the file transfer, text editor, the 80800/Z80 assembler, debugging setting the parameters, copying disks, reformatting the hard disk etc. The advantage of using this system is that a lot of software has been written for it. The floppy disk format is unique and CP/M software on the Commodore MW1000 format is available from Small Systems and MW1000 dealers. It is also possible to transfer other CP/M based computers via the MW1000 serial port using the SEND and READ routines provided.

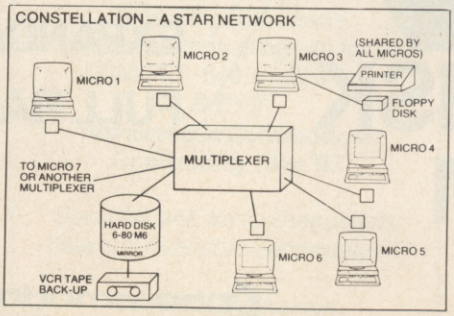
Two interface ports are available; the IEEE-488 which is a 24 way 'd' connector using the standard IEEE bus transceivers and the RS 232 which is bi-directional and software selectable. The price of this mini Winchester unit is considerably less than some of the other hard disks, and would probably suit a small business with a budget. One that did not need the huge memory capacity available in some of the hard disks compatible with Commodore.

Cost: 5 Mbyte £2538; 10 Mbyte £2750; 15 Mbyte £2970. Company: Small Systems Engineering Ltd. Address: 2-4 Canfield Place, London NW6 3BT. Tel: 328 7145.

Keen Computers

Corvus systems are an integrated set of hard disk units compatible with the Commodore 200, 3000, 4000 and the 8000 series. They incorporate the famous Winchester disk technology with its emphasis on reliability and fast access times. Recently, Corvus have produced the new Corvus "H series" Winchester drives. These boast a greater durability, data integrity and enhanced reliability, qualities which according to a popular US computer magazine, are the most important requirements for a potential user of Winchester.

The new series incorporates a number of recent technological improvements. For instance the traditional soft oxide media which covers the hard disks has been replaced with a hard metal alloy plated on the disk surface. This is less likely to suffer a head crash, one of the most dreaded occurences of the hard disk user. This media also gives better recording quality and due to its toughness, there is less likelihood of damage. Another bane of the hard disk is the fragility of its inner assembly rendering them susceptible to damage. A sophisticated shock absorber system changes this and the unit can be carried around without harming it. The new drive will not overheat due to the finned casting which provides better thermal conductivity and the units require no preventive maintenance.



The single user network can be enlarged to become a network of up to 64 microcomputers using the Corvus Constellation. The Constellation is a multiplexer-based, star pattern network (see diagram) and it can provide shared access for each of the micros of up to 80 Mbytes. The memory capacity of the hard disk varies from 6 to 80 Mbytes. One disadvantage is that all the micros have to use the same printer which would be extremely tiresom eif the micros were situated in different locations within a building. Access times on the network are minimised with a through-put transference rate of nearly half a megabit per second. Utilities supplied by Corvus enable multi-user software to be used and

all the records can be on line in a centralised file for immediate access.

The Commodore can be linked to the Corvus hard disk units and the Constellation network via an IEEE interface which connects to either the "Hardbox" or the "Softbox" intelligent controllers. The hardbox gives CBM DOS versions 1 and 2 compatibility with the 3000, 4000 and the 8000 series. With this, a few commands such as MEMORY-READ-WRITE-AND-EXECUTE are excluded. The softbox enables the CBM 2000, 3000, 4000 and the 8000 series to run under the CP/M version 2.2 operating system and no internal modifications are needed. A hardbox or softbox intelligent controller is needed for each CBM pet linked to the hard disks or the constellation network. The constellation multiplexer is needed if there are more than two micros. The cables linking the micros and peripherals to the central multiplexer can be up to 50 feet in length. Each multiplexer can be linked up to support a total of 64 devices and the Corvus hard disk contains software which controls the network communications. There are three models of the Corvus hard disk available: Model 6, 11 and 20 which have a formatted Mbyte capacity of 6.7, 14 and 21 respectively. The minimum access

time of Model 6 is 43 milliseconds and for the Model 11 and 20 it is 29 milliseconds.

Three months of "microcover" is provided for on-site warranty and there are annual maintenance agreements available. The Corvus disk systems can be compatible with most of the popular business systems.

Cost: 6 Mbyte £1795 + VAT, 11Mbyte £2295 + VAT, 20 Mbyte £3995 + VAT. 2 user system £3200 + VAT, each additional user £450 + VAT. Multiplexer £695 + VAT. Company: Keen Computers Ltd., Address: Minerva House, Spaniel Row, Nottingham NG1 6EP. Tel: 0602 412777

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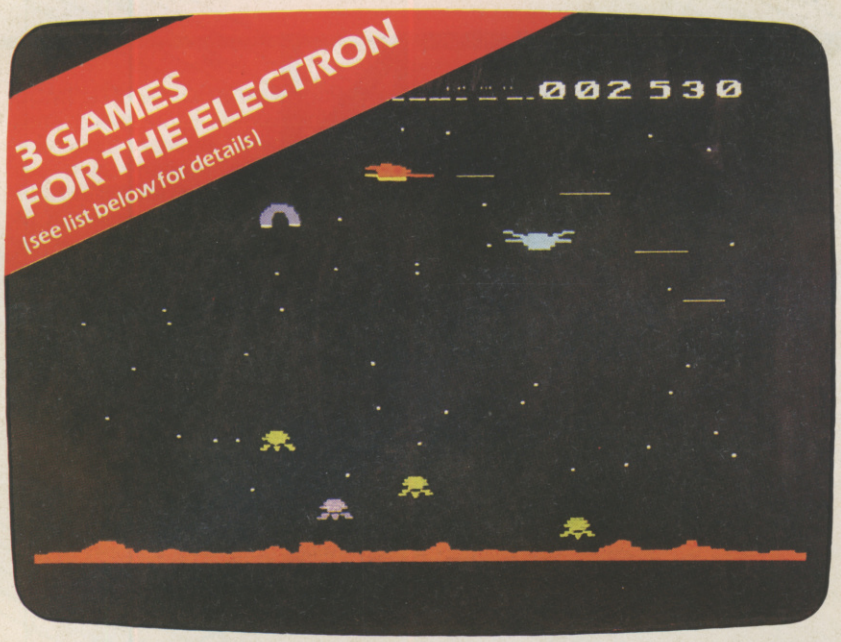

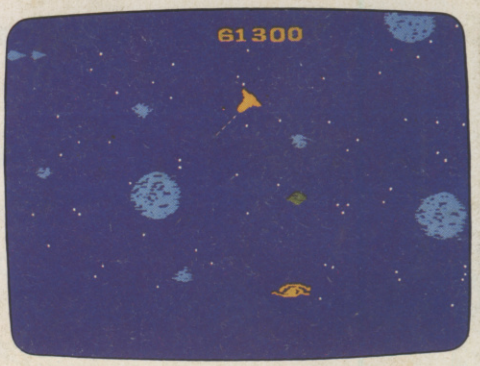

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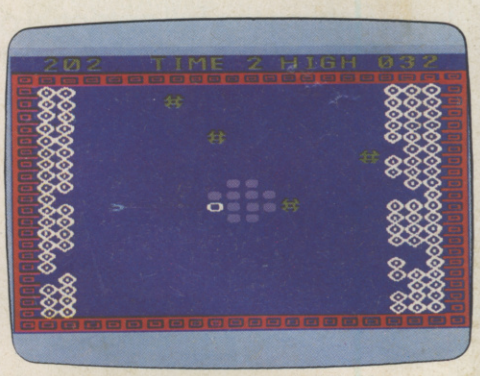

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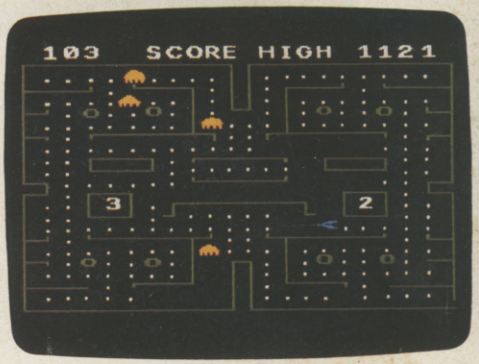

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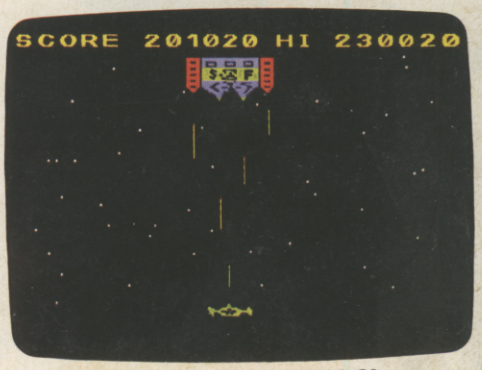

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